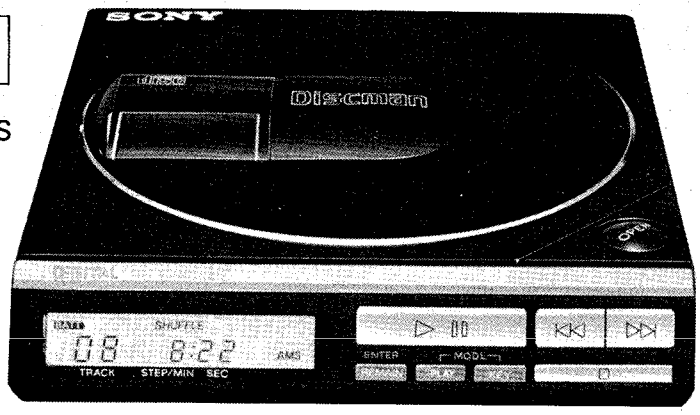
# D-50MkII/D-7S/D-70

# SERVICE MANUAL

AJ11

*REVISED*

Discard D-50MkII/D-7S SERVICE MANUAL (No. 9-952-109-11) previously issued.




*US Model*
*Canadian Model*

**D-50MkII:**

*AEP Model*
*UK Model*
*E Model*
*AUS Model*
*FRENCH Model*

*Dutch Model*

Discman

Refer to BP-200 Service Manual issued previously for information of rechargeable battery pack supplied with this set.

## SPECIFICATIONS

| | |
|---|---|
| System | Compact disc digital audio system |
| Disc | Compact disc |
| Laser diode properties | Material: GaAlAs<br>Wavelength: 780 nm<br>Emission duration: Continuous<br>Laser output: Max. 0.4 mW *<br>*This output is the value measured at a distance of about 1.6 mm from the objective lens surface on the Optical Pick-up Block. |
| Spindle speed | 500 r.p.m. to 200 r.p.m. (CLV) |
| Scan velocity | 1.2–1.4 m/sec. |
| Error correction | Sony Super Strategy Cross Interleave Reed Solomon Code |
| Number of channels | 2 |
| D-A conversion | 16-bit linear |
| Frequency response | 20–20,000 Hz $\pm\frac{1}{3}$ dB |
| Total harmonic distortion | Less than 0.008 % |
| Dynamic range | More than 90 dB (1 kHz) |
| Wow and flutter | Below measurable limit |
| Outputs (at 9 V input level) | Line output (stereo minijack)<br>Output level 1.6 V rms<br>Load impedance over 10 kilohms<br>Headphones (stereo minijack)<br>30 mW + 30 mW at 32 ohms |

**General**

| | |
|---|---|
| Power requirements | Lead acid battery (closed type)<br>using Sony BP-200 rechargeable battery pack (supplied), 6 V<br>Eight IEC designation LR6 alkaline batteries (size AA)<br>using Sony EBP-380 battery case (optional), 12 V<br>DC IN 9 V jack accepts;<br>Sony ac power adaptor (supplied)<br>For use in US, Canadian Model on 120V ac, 60 Hz<br>For use in UK, AUS Model on 240V ac, 50 Hz<br>For use in AEP, Dutch Model on 220V ac, 50 Hz<br>For use in E Model on 110, 120, 220, or 240V ac, 50/60 Hz<br>Sony DCC-120 car battery cord (optional) for use on 12 V car battery |
| Power consumption | 2.6 W dc |
| Dimensions | Approx. 125.9 × 27 × 125.9 mm (w/h/d) ($5 \times 1\frac{1}{8} \times 5$ inches)<br>not incl. inclined part (depth)<br>not incl. projecting parts and controls<br>Approx. 126.9 × 31.5 × 132.5 mm (w/h/d) ($5 \times 1\frac{1}{4} \times 5\frac{1}{4}$ inches)<br>incl. projecting parts and controls |
| Weight | Approx. 510 g (1 lb 2 oz), net |

**CAUTION**

- Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

**SAFETY-RELATED COMPONENT WARNING!!**

COMPONENTS IDENTIFIED BY SHADING AND MARK ⚠ ON THE SCHEMATIC DIAGRAMS AND IN THE PARTS LIST ARE CRITICAL TO SAFE OPERATION. REPLACE THESE COMPONENTS WITH SONY PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL OR IN SUPPLEMENTS PUBLISHED BY SONY.

**ATTENTION AU COMPOSANT AYANT RAPPORT À LA SÉCURITÉ!**

LES COMPOSANTS IDENTIFIÉS PAR UNE TRAME ET UNE MARQUE ⚠ SUR LES DIAGRAMMES SCHÉMATIQUES ET LA LISTE DES PIÈCES SONT CRITIQUES POUR LA SÉCURITÉ DE FONCTIONNEMENT. NE REMPLACER CES COMPOSANTS QUE PAR DES PIÈCES SONY DONT LES NUMÉROS SONT DONNÉS DANS CE MANUEL OU DANS LES SUPPLÉMENTS PUBLIÉS PAR SONY.

# COMPACT DISC COMPACT PLAYER

SONY®

MICROFILM

AUD

## FEATURES

- Extremely compact size for easy carrying
- High performance and high fidelity
- AMS (Automatic Music Sensor) for quick location of selections
- Search function for quick location of a desired point in a particular selection
- RMS (Random Music Sensor) allows selections to be played in a specified order.
- Shuffle-play function repeatedly plays selections in a random order.
- Repeat functions for the whole disc and for a particular portion
- Digital readout display—the track number on the disc and the elapsed or remaining playing time are shown on the LCD (Liquid Crystal Display) window.

## TROUBLE SHOOTING GUIDE

**Disc play does not start.**
- The POWER switch is set to OFF.
- The disc is inserted with the labeled surface face down.
- The disc is incorrectly inserted.
- Dusty or defective disc
- Dirty or dusty lens
- The disc compartment lid is not closed.
- Moisture condensation
- The ac power adaptor is not plugged to the wall outlet.
- Weak battery
- The car battery cord is not firmly connected.

***No sound from headphones***
- The headphones plug is not firmly connected to the PHONES jack.

**No sound from speakers**
- Incorrect connections
- The amplifier is not turned on.

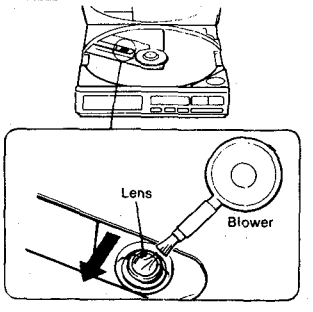
**Skipping of sound**
- Dirty or defective disc
- Dirty lens
- Strong vibration

## MAINTENANCE

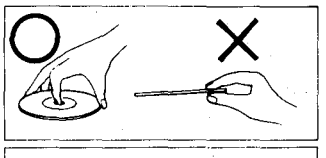
**CLEANING THE CASING**
Clean the casing with a soft cloth slightly moistened with water or mild detergent solution. Do not use any type of abrasive pad, scouring powder or solvent such as alcohol or benzine as they may mar the finish of the casing.

**CLEANING THE LENS**
If you have accidentally touched the lens with a dirty finger or the dust on the lens prevents the set from operating properly, open the disc compartment lid with the OPEN button and clean the lens.

**To remove dust**
Blow on the lens a few times with a commercially available blower, brush the dust away in the direction of the arrow, then blow on the lens again.



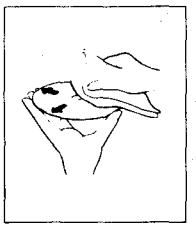

## NOTES ON COMPACT DISCS



Handle the disc by its edge, and to keep the disc clean do not touch the rainbow colored surface.

Do not stick paper or tape nor write anything on the labeled surface.

Do not expose the disc to direct sunlight or heat sources such as hot air ducts nor leave it in a car parked in direct sunlight where there can be a considerable rise in the temperature.



Before playing, clean the disc with the optional cleaning cloth.
Wipe the disc from the center out.

Do not use solvents such as benzine, thinner, commercially available cleaners or anti-static spray intended for analog discs.

After playing, store the disc in its case.

DISC-TELLER DREHT SICH NICHT Code: Has/scho

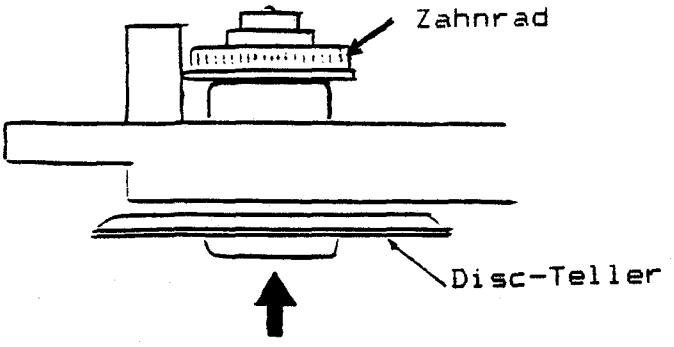
Fehlererscheinung: Der Disc-Teller dreht sich nicht, obwohl der Disc-Motor läuft.

Ursache: Das Zahnrad des Disc-Tellers ist auf der Welle verrutscht.

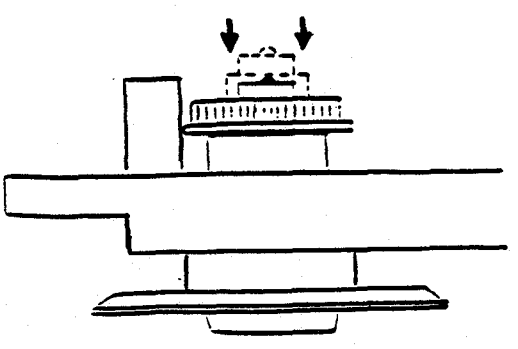
Abhilfe: Zahnrad des Disc-Tellers auf die Messinghülse der Welle schieben, Sicherungslack auftragen und das Zahnrad mit dem Stopper festsetzen.

Verfahren:

1. Disc-Teller in Pfeilrichtung drücken und Zahnrad aufstecken (siehe Bild 1).




2. Messinghülse so weit herunterdrücken, daß sie bündig mit der Oberfläche des Zahnrades abschließt (Bild 2).

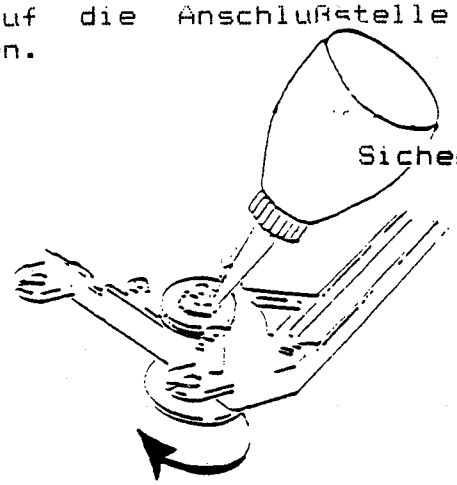




**Abteilung Technische Information**

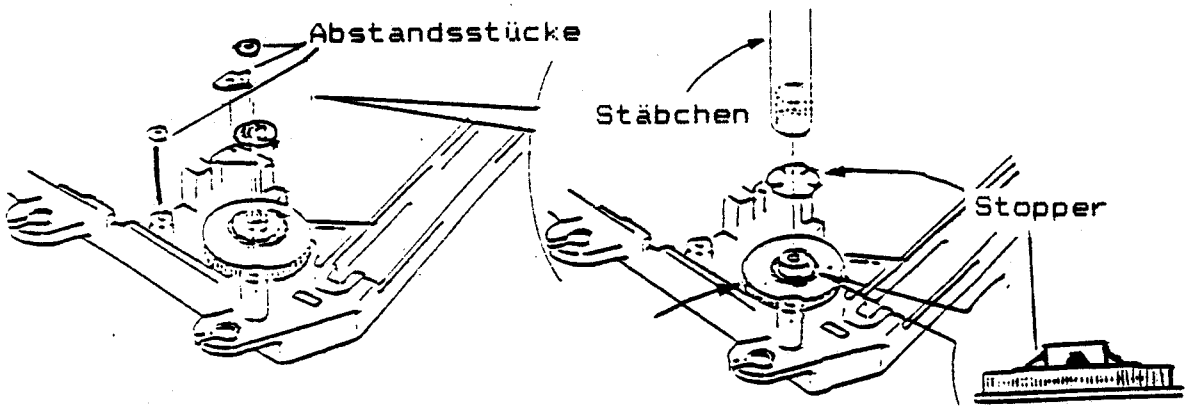
SONY DEUTSCHLAND GmbH, Hugo-Eckener-Straße 20, 5000 Köln 30, Tel.: (02 21) 59 66-1

3. Sicherungslack auf die Anschlußstelle auftragen, dabei den Disc-Teller drehen.

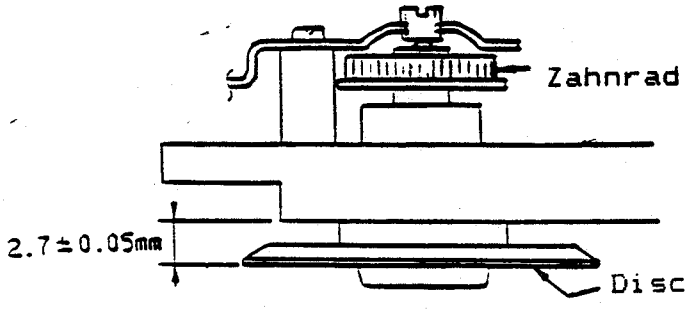



4. Disc-Teller entsprechend Bild 1 nach oben drücken und gleichzeitig den Stopper 1 anbringen und mit dem dazugehörigen Stäbchen fest andrücken.

**Reparatursatz - ET.-Nr.: X-4907-035-1**




5. Höheneinstellung des Disc-Tellers
Konterschraube entsprechend der Dicke des Abstandsringes justieren; die Disc-Tellerhöhe läßt sich durch Abstandsstücke verändern. (Im Reparatursatz enthalten)




Einstellverfahren:
1. Konterschraube um 120 Grad nach rechts drehen.
2. Konterschraube mit Lack sichern.

**Anmerkung:** Die Konterschraube nicht zu fest anziehen, da sich sonst die Höhe verändert, sobald der Schraubendreher herausgezogen wird.

## – CAUTION FOR ELECTROSTATIC BREAKDOWN –

# NOTES ON HANDLING THE OPTICAL PICK-UP BLOCK (KSS-110G)

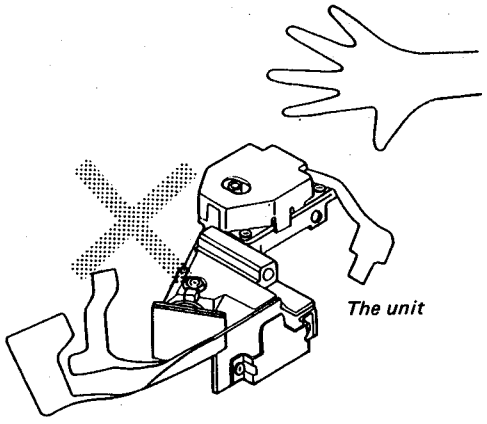
The laser diode in the optical pick-up block may suffer electrostatic breakdown because of the potential difference generated by the charged electrostatic load, etc. on clothing and the human body.
The printed matter below is included in the repair parts. During repair, use the procedure in the printed matter.
The flexible board is easily damaged and should be handled with care.
The following method is an example for reference purposes:

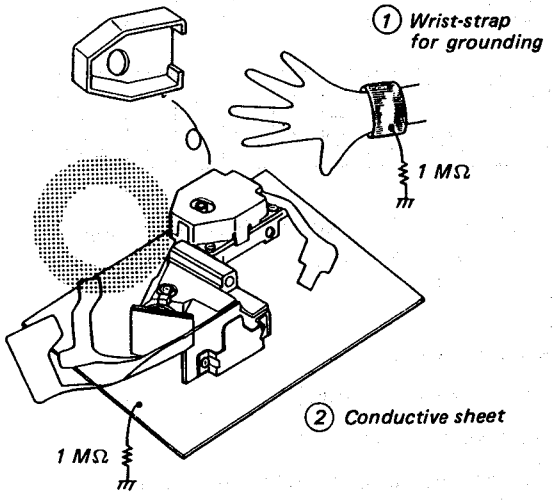
1. Place a conductive sheet on the workbench. (The black sheet used as repair parts wrapping).
2. Place the set on the conductive sheet so that the chassis touches the sheet. (This makes it the same potential as the conductive sheet).
3. Place your hands on the conductive sheet. (This makes them the same potential as the sheet).
4. Remove the optical pick-up block.
5. Perform work on top of the conductive sheet. Be careful that clothing does not touch the optical pick-up block.

**Printed Matter Included in the Repair Parts**

**When opening or repairing the unit, the procedure for grounding as follows is required to prevent damage caused by static electricity.**

1. Grounding for the human body
   Be sure to put on a wrist-strap for grounding (with impedance lower than $10^8$ Ω) whose other end is grounded. The strap works to drain away the static electricity build-up on the human body.
2. Grounding for the work table
   Be sure to lay on the table a conductive sheet (with impedance lower than $10^9$ Ω) such as sheet of copper, which is grounded.
3. As static electricity build-up on clothes is not drainded away, be careful not to let your clothes touch the unit.
4. Handling the flexible board
   The flexible board is easily damaged and should be handled with care.



## Chip Component Indications

The official specifications which are presently indicated are EIAJ standard.

(1) MELF (leadless): EIAJ RC-8001

(2) Square chip components (laminated ceramic): EIAJ RC-3699. Square chip resistors are presently under study by EIAJ.

The following explanation covers square chip components (MELF omitted).

### 1. 2-letter Method (EIAJ RC-3699)

- Letter combination: letter + 1 number
- Letter meaning: letter = effective numeric
  number = multiplier

* The units used are pF for capacitors and Ω (ohm) for resistor.

(This is mainly used for Symbol and Numeric and Multiplier capacitors.)

| Letter | A | B | C | D | E | F | G | H | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Numeric | 1 | 1.1 | 1.2 | 1.3 | 1.5 | 1.6 | 1.8 | 2 | 2.2 | 2.4 | 2.7 |
| Letter | M | N | P | Q | R | S | T | U | V | W | X |
| Numeric | 3 | 3.3 | 3.6 | 3.9 | 4.3 | 4.7 | 5.1 | 5.6 | 6.2 | 6.8 | 7.5 |
| Letter | Y | Z | a | b | d | e | f | m | n | t | y |
| Numeric | 8.2 | 9.1 | 2.5 | 3.5 | 4 | 4.5 | 5 | 6 | 7 | 8 | 9 |

| Number | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| Maltiplier | $10^0$ | $10^1$ | $10^2$ | $10^3$ | $10^4$ | $10^5$ | $10^6$ | $10^7$ | $10^8$ | $10^{-1}$ |

- Ex.: A1 $1 \times 10^1 = 10$ pF (or, 10Ω)
  E3 $1.5 \times 10^3 = 1500$ pF (or, 1.5 kΩ)

### 2. 3-number Method

(Mainly used for chip resistors)

- Number meaning:

  1st and 2nd number = effective numeric
  3rd number = multiplier of 10

  Unit: pF for capacitor, for resistor

- Ex.: 103 $10 \times 10^3 = 10000\Omega = 10$ kΩ (or, 0.01 μF)
  224 $22 \times 10^4 = 220000\Omega = 220$ kΩ (or, 0.22 μF)

### 3. 4-letter Method (used for capacitor)

- Letter combination: 3 numbers + 1 letter
- Letter meaning: number = effective numeric + multiplier of 10 (same as 3-number method)
  letter = capacitor response
- Symbol and Response

〈 For temperature compensation 〉

| Symbol | C | P | R | S | T | U | (NO) |
|---|---|---|---|---|---|---|---|
| Response | CΔ | PΔ | RΔ | SΔ | TΔ | UΔ | SL |

Δ is temperature coefficient tolerance, and is G, H, J, K.

〈For high dielectric constant〉

| Symbol | K | Z |
|---|---|---|
| Response | B | F |

- Ex.:

47 3Z → $47 \times 10^3 = 47000$pF = 0.047μF F response

15 1R → $15 \times 10^1 = 150$pF RΔ response

22 2 → $22 \times 10^2 = 2200$pF SL response

**Replacing chip components**

All chip components should be connected and disconnected, using a tapered soldering iron [temperature of the iron tip: less than 280°C (536°F)], a pair of tweezers and braided wire.

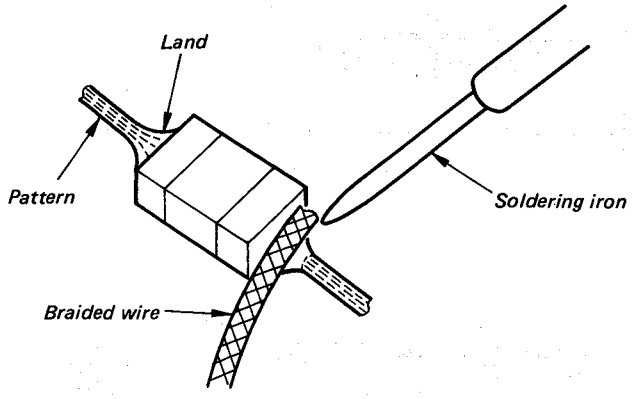
**Precautions for replacement**

1. **Do not disconnect the chip component forcefully. Otherwise, the pattern may peel off.**
2. **Never re-use a disconnected chip component. Dispose of all old chip components.**
3. **To protect the chip component, heating time for attaching the component should be within 3 seconds.**

**○ Removing chip components**

**(1) Removing solder at electrode**

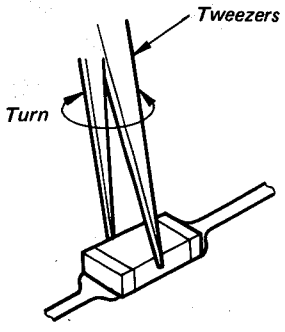
Remove the solder at the electrode, using a thin braided wire. Do not remove the solder of the part (chip component) attached adjacent to the electrode.




**(2) Disconnecting chip components**

Turn the tweezers with the soldering iron alternately applied to both electrodes, and the chip component will be disconnected. Take careful precautions while disconnecting, because if the chip component is forcefully removed the land may peel off.

Never re-use a disconnected chip component.




**(3) Smoothing the soldered surface**

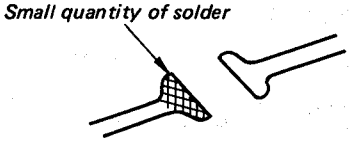
After disconnecting the chip component, remove the solder by using a braided wire to smooth the land surface.

**○ Connecting chip components**

The value of chip components is not displayed on the main body. Take due precautions to avoid mixing new chip components with other ones.

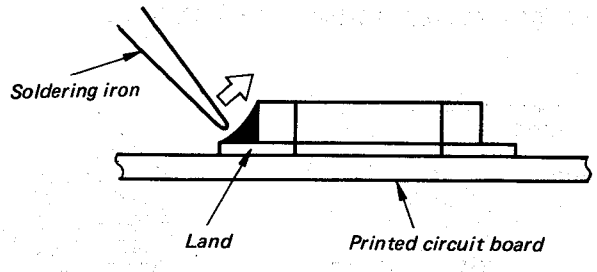
**(1) Applying solder to land on one side**

Apply a thin layer of solder to the land on one side where the chip component is to be connected. Too much solder may cause bridging.




**(2) Speedy soldering**

Hold the chip component at the desired position, using tweezers, and apply the soldering iron in the arrow-marked direction. To protect the chip component, heating time should be within 3 seconds.



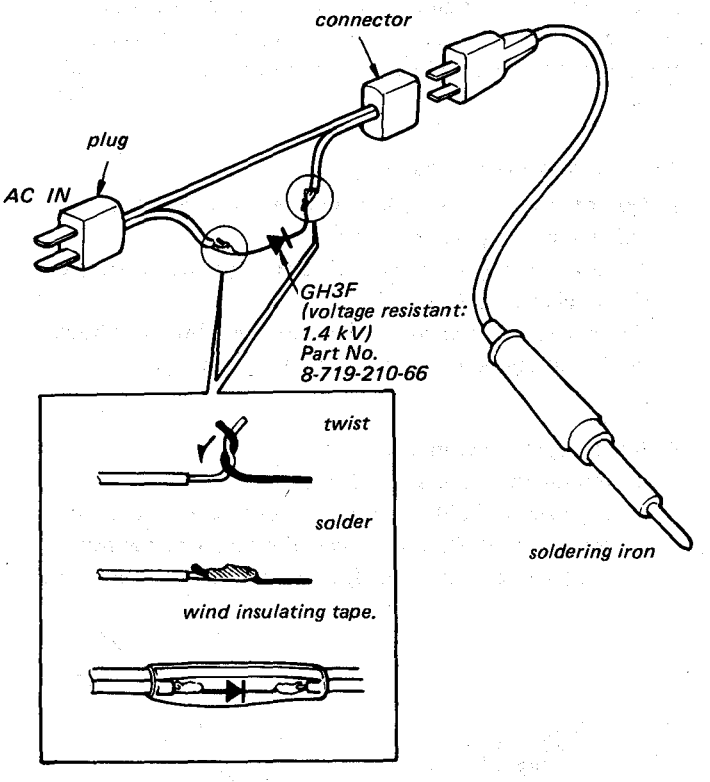

**(3) Speedy soldering of electrode on the other side**

Solder the electrode on the other side in the same way as in (2) above.

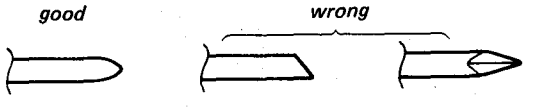
### Flexible Circuit Board Repairing

1. Keep the temperature of the soldering iron at 270° ± 10°C during repairing.
   You can maintain the temperature of the soldering iron around 270°C by using the thermal controller as illustrated on the right.
2. Do not touch the soldering iron more than 4 seconds or 3 times on the same conductor of the circuit board.
3. Do not apply force on the conductor when soldering or unsoldering.

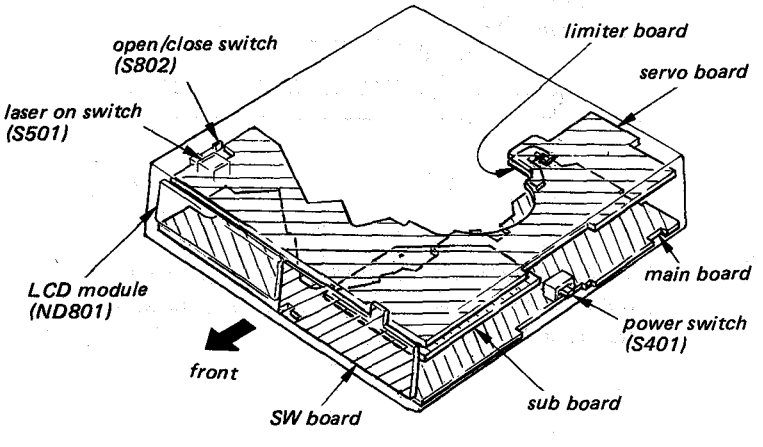
### To make thermal controller of soldering iron

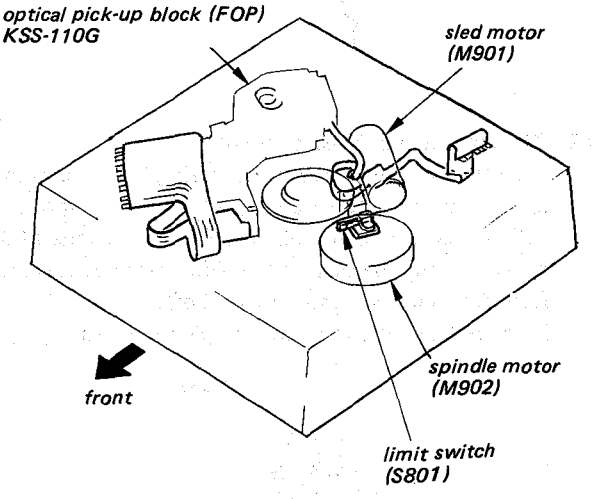



### Tip of soldering iron




## PC BOARDS/SWITCH/MOTOR LAYOUTS



## SERVICE MODE (service program)

As shown on page 17, the program on this set selects either service program routine or normal routine after power supply is connected and a $\overline{\text{RESET}}$ signal enters. When it enters service program routine, the microcomputer brings the necessary job from each subroutine corresponding to the key input, and executes that job. Operation check can be performed efficiently using this mode. The operation method of service mode is explained below.

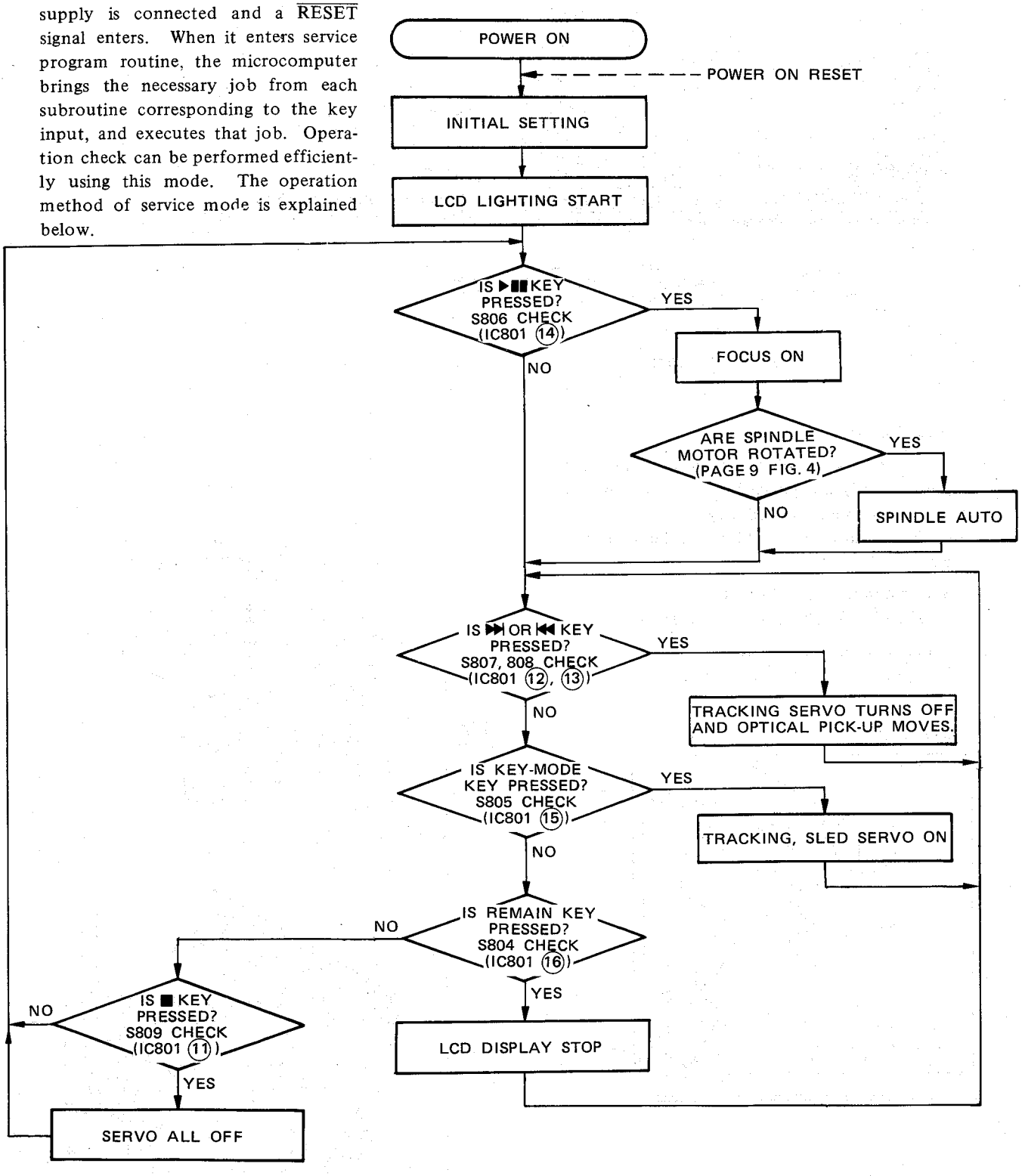



*Fig. 1 Service Program Flow Chart*

## NOTES ON LASER DIODE EMISSION CHECK

The laser beam on this model is concentrated so as to be focused on the disc reflective surface by the objective lens in the optical pick-up block. Therefore, when checking the laser diode emission, observe, from more than 30 cm away from the objective lens.

### Laser Diode Check Procedure

The laser diode on this set will not emit unless the top panel is closed and S501 (terminal sorting type), S802 (leaf SW type) are turned on.
Focus search can be operated in service mode even if S802 is OFF, so that the laser diode will emit if S501 (terminal shorting type) are turned on in this mode.

The laser diode is checked using the current value which flows to the laser diode inside the FOP.
Procedure 1 (service mode or normal operation).
Check the laser diode emission with the eye.

1. Open upper panel and turn S501, 802 on as Fig. 5. In the service mode, turn on S501 only.
2. Press the ▶II key.
3. Observe the objective lens and confirm that the laser diode is emitting light. At this time, the laser diode goes on about 3 seconds due to focus search. If it does not, APC circuit or FOP is defective.

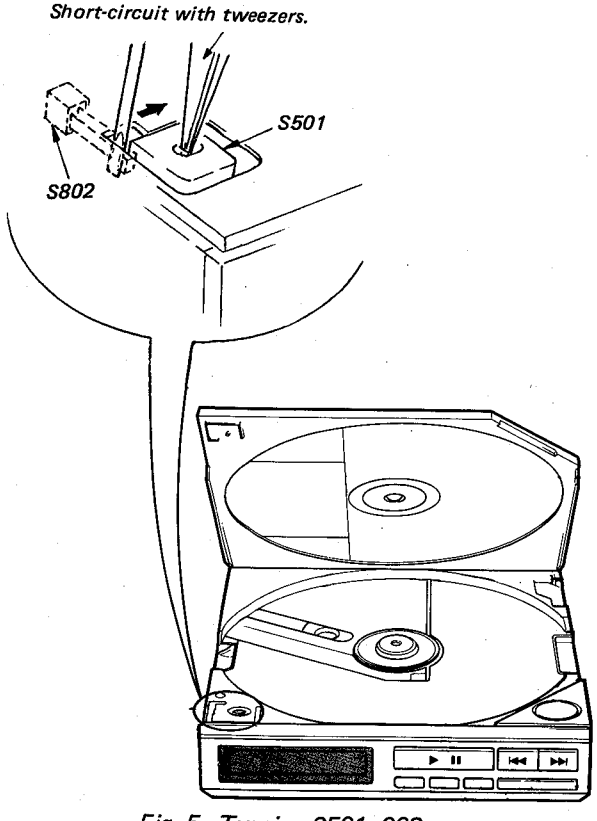
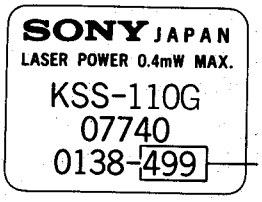



*Fig. 5 Turning S501, 802 on*

Procedure 2 (service mode or normal operation).
Check by the curent with flows in the laser diode.

1. Close the top panel.
2. Remove the main board and read the current value on the label affixed to the FOP.
(Label on FOP)




current value
This means 49.9 mA.

The current value varies with the set.

3. Connect a VOM as shown in Fig. 6.
4. Press the ▶II key.
5. Calculate the current by the VOM reading.
VOM reading (V) ÷ 19.5 = current (A)
ex. VOM reading = 0.97 V
0.97 ÷ 19.5 = 0.0497 (A) = 49.7 (mA)
6. Confirm that the ammeter reading is within the range given below.
value on label $^{+11}_{-5}$ mA (25°C)
variation relative to temperature:
0.4 mA/°C
(Current increases when temperature rises and decreases when it drops.)
If the value is more than the range given, APC circuit has been defective or the laser diode has deteriorated. If it is less, APC circuit or FOP is defective.

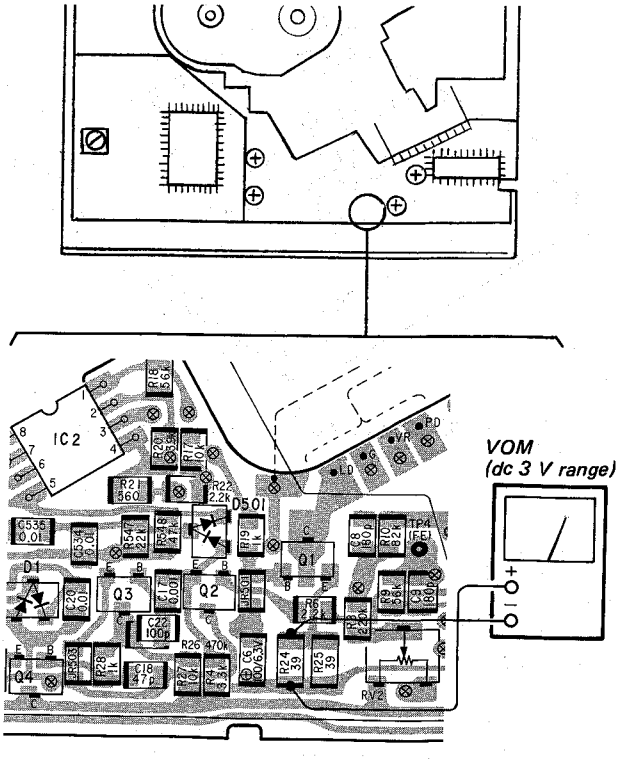


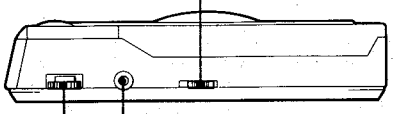

*Fig. 6 VOM Connection*

## LOCATION AND FUNCTION OF CONTROLS

Refer to the pages indicated in ● for details.

### Right side

**POWER switch**
Set to OFF when transporting the unit so that the player will not operate, even if an operation key is accidentally pressed.



**VOLUME (headphones volume) control** ⓬

**PHONES (headphones) jack** ⓬
(stereo minijack)

### Rear panel

**LINE OUT jack** (stereo minijack)
Can be connected to an amplifier or a tape recorder, with the supplied connecting cord.

**DC IN 9V (external power input) jack**
Connects the optional ac power adaptor or car battery cord.

### Front

**Lens**
The laser beam is emitted from this point to pick-up the signal on the disc.

**Disc compartment**
Insert a compact disc here.

**▶II (play/pause) key** ⓬

**OPEN button** ⓬
Press this button to open the disc compartment lid.

**■ (stop) key**
Press this key to stop play. The power will be turned off.

**Display window** ⓫

**Safety slot**
Do not put anything in this slot. If the disc compartment lid is not firmly closed the laser beam emission will not be contained.

**AMS (Automatic Music Sensor)/Search key** ⓬ ⓭
Press the |◀◀ or ▶▶| key to locate the beginning of the desired selection while the AMS indicator is displayed.
Press the |◀◀ or ▶▶| key to locate the desired point in a particular selection while the SEARCH indicator is displayed.

**KEY MODE key** ⓬
Press this key to select either the AMS or Search function.

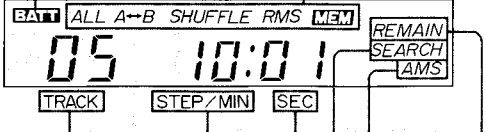
**PLAY MODE key** ⓬ ⓭
Press this key to select one of five play modes: Normal, ALL repeat, A⟷B repeat, SHUFFLE repeat, RMS play.
Each time the key is pressed, the previous mode is cancelled and the next mode is activated.

**REMAIN/ENTER key** ⓬ ⓭
Press this key and the time counter shows the time (preceded by a minus sign) which remains before the end of the last selection.
For A⟷B repeat play and RMS play, use this key to memorize.

### Display window

**BATT (battery) indicator**
Appears during play or pause. When the batteries are weak, the indicator flickers.

**Play mode indicators**
Indicate the following play modes.
**No indicator:** Normal play
**ALL:** All repeat play
**A⟷B:** A⟷B repeat play
**SHUFFLE:** Shuffle repeat play
**RMS MEM :** Memorization of a displayed selection's track number
**RMS:** RMS play




**TRACK indicator** ⓬
Shows the track number of the selection being played or the remaining number of selections on the disc.

**STEP/MIN (minute) indicator** ⓬ ⓭
Shows the elapsed playing time from the beginning of a selection in minutes or during the RMS memorization process the order in which selections are memorized.

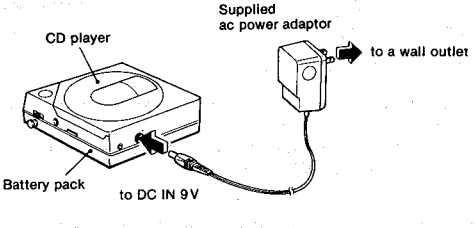
**REMAIN indicator** ⓬

**AMS indicator** ⓬

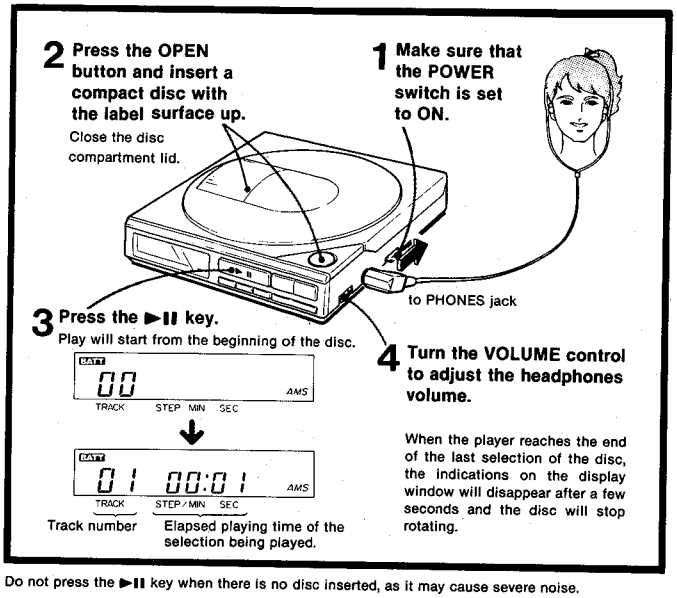
**SEARCH indicator** ⓬

**SEC (second) indicator**

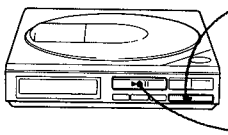
### HOW TO RECHARGE THE BATTERY PACK



## DISC PLAYING


2 Press the OPEN button and insert a compact disc with the label surface up.
Close the disc compartment lid.
1 Make sure that the POWER switch is set to ON.
to PHONES jack
3 Press the ▶II key.
Play will start from the beginning of the disc.
4 Turn the VOLUME control to adjust the headphones volume.
When the player reaches the end of the last selection of the disc, the indications on the display window will disappear after a few seconds and the disc will stop rotating.
TRACK
STEP MIN SEC
AMS
Track number
Elapsed playing time of the selection being played.

Do not press the ▶II key when there is no disc inserted, as it may cause severe noise.



### TO STOP DURING PLAY

**Press the ■ key.**
The indications on the display window will disappear after a few seconds and the disc will stop rotating.

### TO PAUSE DURING PLAY

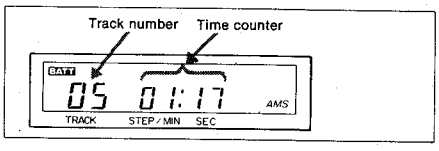
**Press the ▶II key.**
The time counter on the display will flicker.
To release the pause mode, press the ▶II again.

## USING THE TIME COUNTER

Each time the REMAIN/ENTER key is pressed, the display shows the elapsed playing time or the remaining playing time.

### TO MONITOR THE ELAPSED PLAYING TIME

Generally, the time counter shows the elapsed playing time from the beginning of the selection in minutes and seconds.

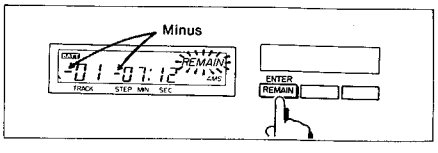



Shows 1 minute 17 seconds have elapsed from the beginning of the fifth selection.

When a new selection starts, the counter is reset to "00:00" and then starts counting again.
If the selection has a blank space at its beginning, the counter is reset to negative number such as "–00:02" or "–00:01".

### TO MONITOR THE REMAINING PLAYING TIME

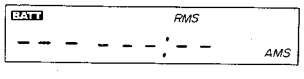
When the REMAIN/ENTER key is pressed, the counter shows the remaining number of selections and the remaining time, each preceded by a minus.




Shows 1 selection and 7 minutes and 12 seconds are remaining before the end of the disc.

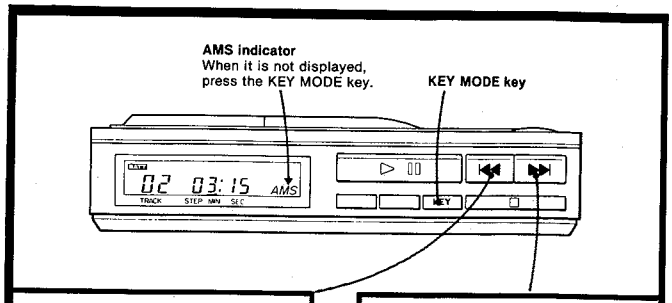
**Note:** During repeat play and shuffle play the counter shows the remaining selections and time as if the player is in the normal playing mode, rather than those actual remaining.

When the REMAIN/ENTER key is pressed during RMS play, the following appears on the display.




## TO SEARCH FOR A PARTICULAR SELECTION
**—AMS (Automatic Music Sensor) function**

During play or pause, proceed as follows.



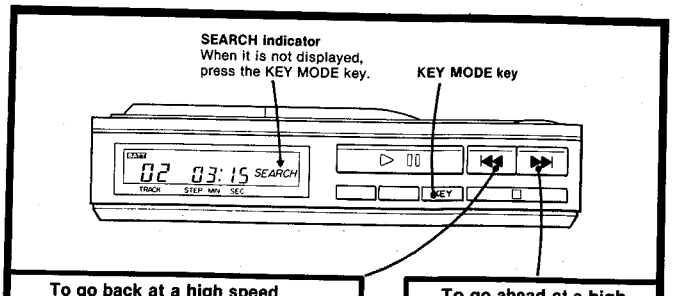

**To search for a previous selection**
When the |◀◀ key is pressed once, the beginning of the selection being played is searched for.
When the key is continuously pressed, the previous selection is searched for.

**To search for a selection ahead**
When the ▶▶| key is pressed once, the selection after the one being played is searched for.
When the key is continuously pressed, the selection after that will be searched for.
After the last selection the TRACK indicator will not change.

- In the pause mode press the |◀◀ or ▶▶| key by observing the TRACK indicator on the display. The player pauses at the beginning of the desired selection.
- During RMS play, AMS operates in the memorized order.

## TO SEARCH FOR A PARTICULAR POINT IN A SELECTION —SEARCH function

During play or pause, proceed as follows.

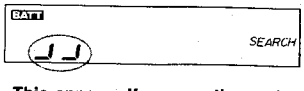



**To go back at a high speed**
Keep the |◀◀ key pressed.
Monitoring the high speed sound to locate the desired point, release the key to restart the play.

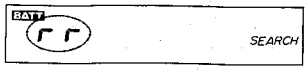
**To go ahead at a high speed**
Keep the ▶▶| key pressed.
Monitoring the high speed sound to locate the desired point, release the key to restart the play.

**In pause mode**
- The search speed is higher than during play.
- Locate the desired point by observing the time counter on the display as there is no sound to be heard.
- Press the ▶II key to restart the play.

**What are these indications?**




**This appears if you continuously press the ▶▶| key** at the end of the disc.
To return to a TRACK indication, press the |◀◀ key.

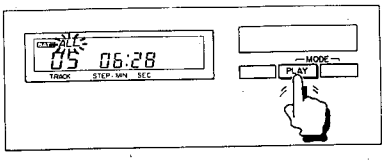



**This appears if you continuously press the |◀◀ key** at the beginning of the disc.

# REPEAT PLAY

## TO REPEAT THE WHOLE DISC —All repeat play

During play or pause, press the PLAY MODE key repeatedly until the ALL indicator appears on the display window.

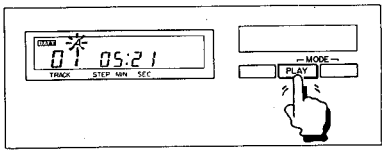



When the disc reaches the end of the last selection, the player will automatically go back to the beginning of the first selection, and play will restart.

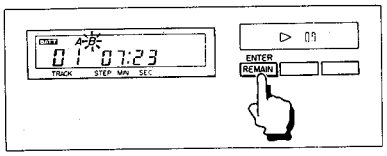
**To release the repeat mode,** press the ■ key.

## TO REPEAT PLAY BETWEEN TWO DESIGNATED POINTS
**—A⟷B repeat play**

1 During play or pause, press the PLAY MODE key repeatedly until the A indicator appears on the display window.




2 Locate the point from which the repeat play starts (point A) using the AMS or Search function and press the REMAIN/ENTER key.
The A indicator stops flickering showing that point A is memorized and the B indicator starts flickering.




3 Locate the stopping point (point B) and press the REMAIN/ENTER key.
The B indicator stops flickering showing that point B is memorized.
The disc goes back to point A and play starts.
During pause, press the ▶II key to start the play.

**To release the repeat mode,** press the ■ key.

## MORE ABOUT A⟷B REPEAT FUNCTION

**To repeat only one selection**

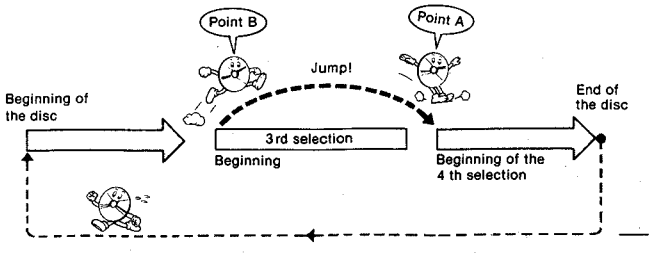
1 Press the ▶II key to set the player in pause mode.
2 Press the PLAY MODE key repeatedly until the A indicator appears on the display window.
3 Locate the beginning of the desired selection (point A) using the AMS function and press the REMAIN/ENTER key.
4 Press the ▶▶| key once to locate the beginning of the following selection (point B) and press the REMAIN/ENTER key.
5 Press the ▶II key again to start playing.

Repeat play of the last selection of the disc cannot be done this way.
Use the Search function (refer to "A ⟷ B repeat play").

**To repeat while eliminating an unwanted portion (jump repeat)**

1 Press the ▶II key to set the player in pause mode.
2 Press the PLAY MODE key repeatedly until the A indicator appears on the display window.
3 Locate the beginning of the selection following the one to be eliminated (point A) using the AMS function and press the REMAIN/ENTER key.
4 Locate the beginning of the selection to be eliminated (point B) and press the REMAIN/ENTER key.
The TRACK indicator returns to point A.
5 Press the ▶II key to start playing.

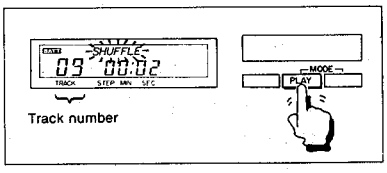
**Example: To eliminate the 3rd selection**




# TO PLAY THE SELECTIONS IN A RANDOM ORDER
**—Shuffle play**

In this mode, there is no way of knowing which selection will be played next. After all of the selections on the disc have been played in a random order, they are reshuffled so that you can listen to the same disc continuously, but with the selections played in a different order each time.

During play or pause, press the PLAY MODE key repeatedly until the SHUFFLE indicator appears on the display.
Shuffle play starts from the following selection.




**To release the shuffle play mode,** press the ■ key.

**AMS and Search operation during shuffle play**

| Indicator \ Operation | |◀◀ key | ▶▶| key |
|---|---|---|
| AMS | Beginning of the selection being played* | (with each press) Beginning of the following selection |
| SEARCH | | (with continuous press) Ahead to the following selection |

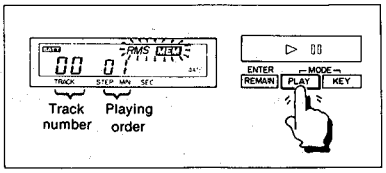
*You cannot return to the previous selection. When the unit reaches the beginning of the selection being played, play starts automatically.

# TO PLAY THE DESIRED SELECTIONS IN THE DESIRED ORDER
**—RMS (Random Music Sensor) play**

With the RMS feature, up to 16 selections can be played in the order you prefer.

## HOW TO MEMORIZE SELECTIONS

1 During play or pause, press the PLAY MODE key repeatedly until the RMS MEM indicator appears on the display window.
The STEP/MIN indicator shows 01.
If you press the ▶II key in the pause mode, the player will stop.




2 Press the KEY MODE key so that the AMS indicator appears.
3 Press the |◀◀ or ▶▶| key and locate the beginning of the desired selection by observing the TRACK indicator on the display.
4 Press the REMAIN/ENTER key.
The selection shown by the TRACK indicator is memorized as the first selection and the STEP/MIN indicator changes to 02.

Repeat steps 3 and 4 to memorize up to 15 other selections.

When 16 selections have been memorized, the STEP/MIN indicator will return to 01. If you continue to memorize other selections, the last selection memorized will be cleared and the new one memorized in its place.

## HOW TO START RMS PLAY

**Press the ▶II key.** (During pause, press the ▶II key twice.)
The **MEM** indicator will disappear and the selections are played in the memorized order.

**To release the RMS play,** press the ■ key.

**Note**
As the RMS searches for the next memorized selection very quickly, there may be little blank space between selections. When the selections played with the RMS feature are recorded on the tape, the AMS function of the cassette player may not be activated.

# SECTION 1
# OUTLINE

## 1-1. CIRCUIT DESCRIPTION

### [SYSTEM CONTROL 4-BIT MICROCOMPUTER]

Table 1 explains the ports and Fig. 7 is the program flor chart. When power is applied to the set, a $\overline{RST}$ signal is applied to the microcomputer and the program starts. First judgement is made whether to go to service mode. (Service mode is explained on page 7 – 9.) When it goes to a regular mode, clock oscillation is stopped, stand-by occurs, and waiting for $\overline{PB/PAUSE}$ input results. Clock oscillation is stopped for saving power consumption.

When the PB/PAUSE button is pressed, the program continues on to the main routine, and continues running on the main loop until the STOP button is pressed or until some kind of trouble causes emergency stop to be generated.

The SUB-Q signal is applied to the serial data input port (SI), WFCK to the shift clock input (SC) and SCOR to external interrupt input port ($\overline{IRQ}$), and SUB-Q is read into the RAM by the interrupt processing routine in the main loop.

The following are the three types of interrupt processing:

(1) External interrupt: by SCOR (75 Hz)

(2) Timer/Counter overflow interrupt: by built-in counter (50 Hz)

(3) Serial Buffer F/E (FULL/EMPTY) interrupt: executed when 4 bits of SUB-Q accumulate

Priority order is by number, in order from the lowest, and interrupt begins from high priority interrupt after the currently executed command is completed. On this set, first the loop turns at 50 Hz (20 msec) by interrupt (2) until servo is applied. Then when SUB-Q can be read in, interrupt (1) causes the loop to turn at 75 Hz (13.3 msec). Then SUB-Q 4 bit processing (sent from register to RAM) is performed at approximately 600 $\mu$sec cycles by interrupt (3).

The above is an outline of the program. The main program features are listed below.

(1) Focus search is done 3 times.

(2) For normal STOP, FOP is not stopped above the TOC area as before, but at music data area near the innermost circumference. For emergency stop due to OPEN or BATT EMP, it stops right away, where it is. During PLAY, the FOP searches for TOC and reads it, then begins playback.

(3) Search operation (music search) is done by performing 1 track jump three times in a row.

(4) Service program is built-in. (Refer to next chapter.)

(5) FZC (Focus Zero Cross) is only detected when the lens goes up.

*Table 1 Pin Functions*

| Pin No. | Port Name | Signal Name | I/O | Function |
|---|---|---|---|---|
| 1 | R2 | ——— | ——— | Not used. |
| 2 | R3 | MUTE | OUTPUT | Muting signal output pin. CX23035 (IC601), LINE output and HEADPHONE output are muted mode at "H". |
| 3 | R0 | $\overline{\text{BATT-E}}$ | INPUT | Normal operation:<br>Battery down signal input pin. When this pin goes "L", it detects running out of the battery.<br>Service mode:<br>This input pin switches the operation mode on the set. Goes from normal mode to service mode when $\overline{\text{RST}}$ input is supplied at "L". |
| 4 | R1 | $\overline{\text{BATT-W}}$ | INPUT | Battery voltage reduction input pin. When power supply voltage is less than 5.9 V, "L" is input |
| 5 | SC | WFCK | INPUT | Shift-clock input pin of serial I/O (SI). This is a clock signal to read SUB-Q signal. WFCK is input from CX23035 (IC601). |
| 6 | NC | ——— | ——— | Not used. |
| 7 | TC | CRCF | INPUT | This pin inputs the result of CRC of SUB-Q from CX23035 (IC601). and judges if there is no error in SUB-Q signal read at WFCK.<br>"H": correct "L": error |
| 8 | S1 | SUB-Q | INPUT | Serial I/O data input pin. SUB-Q signal (information about the music address and emphasis, etc.) is input. |
| 9 | R12 | $\overline{\text{S-LIMIT}}$ | INPUT | Limit switch (S801) input pin. When this pin inputs "L", detects FOP reaching the inner most circumference. |
| 10 | R13 | $\overline{\text{S-OPEN}}$ | INPUT | OPEN/CLOSE switch (S802) input pin. When this pin inputs "L", detects that the upper panel is open. |
| 11 | R14 | $\overline{\text{STOP}}$ | INPUT | ■ switch input pin. This pin detects fall of input and goes to the set stand-by mode. |
| 12 | R15 | $\overline{\text{FR}}$ | INPUT | ⏮ switch (S808) input pin. |
| 13 | K0 | $\overline{\text{FF}}$ | INPUT | ⏭ switch (S807) input pin. |
| 14 | K1 | $\overline{\text{PB/PAUSE}}$ | INPUT | ⏯ switch (S806) input pin. |
| 15 | K2 | $\overline{\text{K-MODE}}$ | INPUT | AMS/SEARCH switch (S805) input pin. |
| 16 | K3 | $\overline{\text{REM/ENT}}$ | INPUT | REM/ENT switch (S804) input pin. |
| 17 | R8 | SENSE | INPUT | Input pin of SENSE output of CX23035 (IC601) and, CXA1023M (IC501). When fowarding serial data to CXA1023M, the signal which monitors the mode of the specified servo circuit is input. |
| 18 | R9 | FOK | INPUT | Focus servo permission input pin. This pin detects the focus at "L". |
| 19 | R10 | GFS | INPUT | Input pin of Guarded Frame Sync of CX23035 (IC601) "L" is input when CX23035 reads the data of the disc correctly. |
| 20 | S0 | $\overline{\text{P-MODE}}$ | INPUT | PLAY MODE switch (S803) input pin. |

| Pin No. | Port Name | Signal Name | I/O | Function |
|---|---|---|---|---|
| 21 | R4 | LATCH | OUTPUT | When fowarding the serial data to CX23035 (IC601) and CXA1023M (IC501), LATCH signal is input. |
| 22 | R5 | $\overline{\text{CLOCK}}$ | OUTPUT | When fowarding the serial data to CX23035 (IC601) and CXA1023M (IC501), CLOCK signal is input. |
| 23 | R6 | DATA | OUTPUT | Serial data output pin to CX23035 (IC601) and CXA1023M (IC501). |
| 24 | R7 | $\overline{\text{DIRECT}}$ | OUTPUT | Output pin to CXA1023M (IC501) at 1-track jump. Normally "H". The direction of jump level is reversed at "L". Next, normal tracking mode is set by going to "L". This pin outputs "L" for a limited time when detecting TZC (Tracking Zero Cross) rise or fall. |
| 25 | Vss | Vss | ——— | Ground pin |
| 26 | P2 | ——— | ——— | Not used. |
| 27 | P3 | $\overline{\text{RESET}}$ | OUTPUT | CX23035 (IC601) and CXA1023M (IC501) reset signal output pin. Each IC is reset by outputting "L". |
| 28 | P1 | MATT | OUTPUT | This output pin maintains inert motor rotation. This pin outputs "H" during the interval from motor begins turning to FOP focus. |
| 29 | R11 | PEN | OUTPUT | Emphasis switching output pin of analog circuit. This pin outputs due to an emphasis signal in SUB-Q signal, and switches the analog circuit. |
| 30 | P0 | $\overline{\text{P-CON}}$ | OUTPUT | This output pin controls power ON/OFF. "L": Power ON "H": Power OFF |
| 31 \| 50 | SEG19 \| SEG0 | SEG19 \| SEG0 | OUTPUT | Segment output pin. |
| 51 \| 54 | COM3 \| COM1 | COM3 \| COM1 | OUTPUT | Common output pin (4 partition display). |
| 55 \| 57 | V0 V1 V2 | V0 V1 V2 | OUTPUT | Power supply pin for LCD bias. |
| 58 | Vcc | Vcc | ——— | Power supply pin. |
| 59 | $\overline{\text{VL}}$ | $\overline{\text{VL}}$ | OUTPUT | This control pin cuts off the current flowing to LCD bias resistor in stand-by mode. |
| 60 | XTAL | XTAL | OUTPUT | Output pin for clock generation circuit. |
| 61 | EXTAL | EXTAL | INPUT | Input pin for clock generation circuit. |
| 62 | $\overline{\text{RST}}$ | $\overline{\text{RST}}$ | INPUT | External reset signal input pin. This set is reset at "L". |
| 63 | START | START | INPUT | This pin cancels the stand-by mode on the set. The stand-by mode is canceled by rising ( ⎍ ) of input. |
| 64 | $\overline{\text{IRQ}}$ | $\overline{\text{SCOR}}$ | INPUT | Interrupt input pin. SCOR (sync signal with SUB-Q) is input from CX23035 (IC601) and detects the tip of SUB-Q signal by detecting fall ( ⎎ ) of input. |

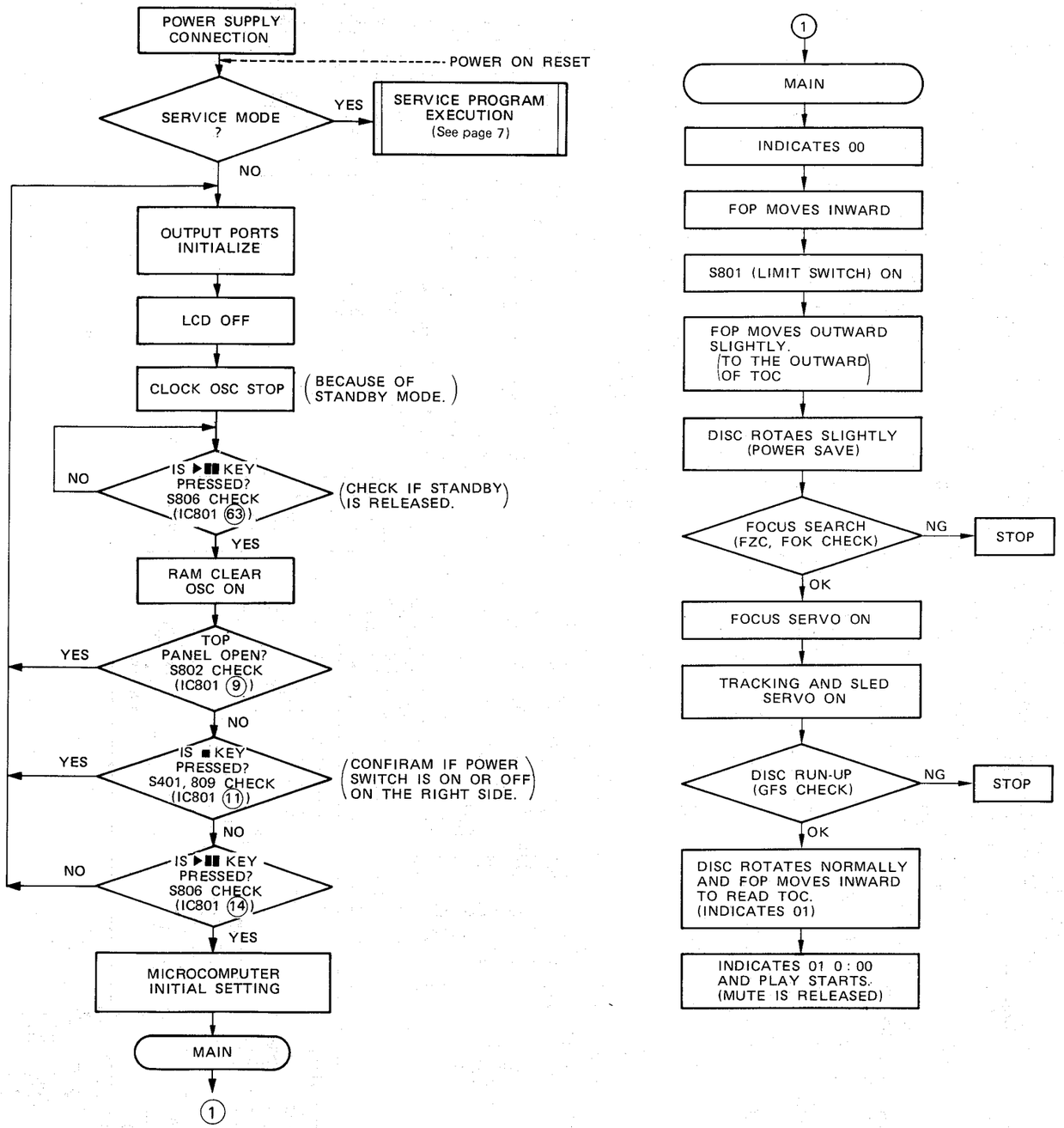



*Fig. 7 Program Flow Chart*



## • SERVICING NOTE

**Charge Circuit Check**

1. Connect a 10 kΩ resistor as shown in Fig. A. (Between pin (1) and pin (3) of battery terminal CNJ401.)
2. Supply 9 V dc through external power jack.
3. If the voltage of pin (2) of CNJ401 is 7.3 V, charge circuit is normal.

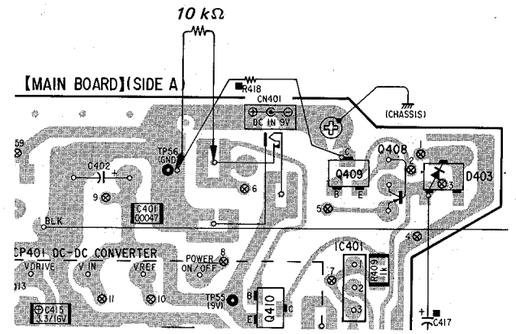



*Fig. A Connection*

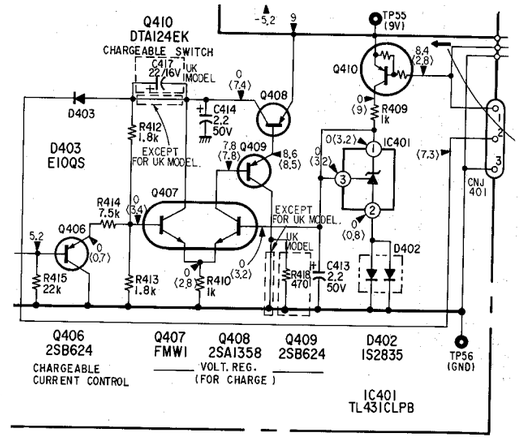
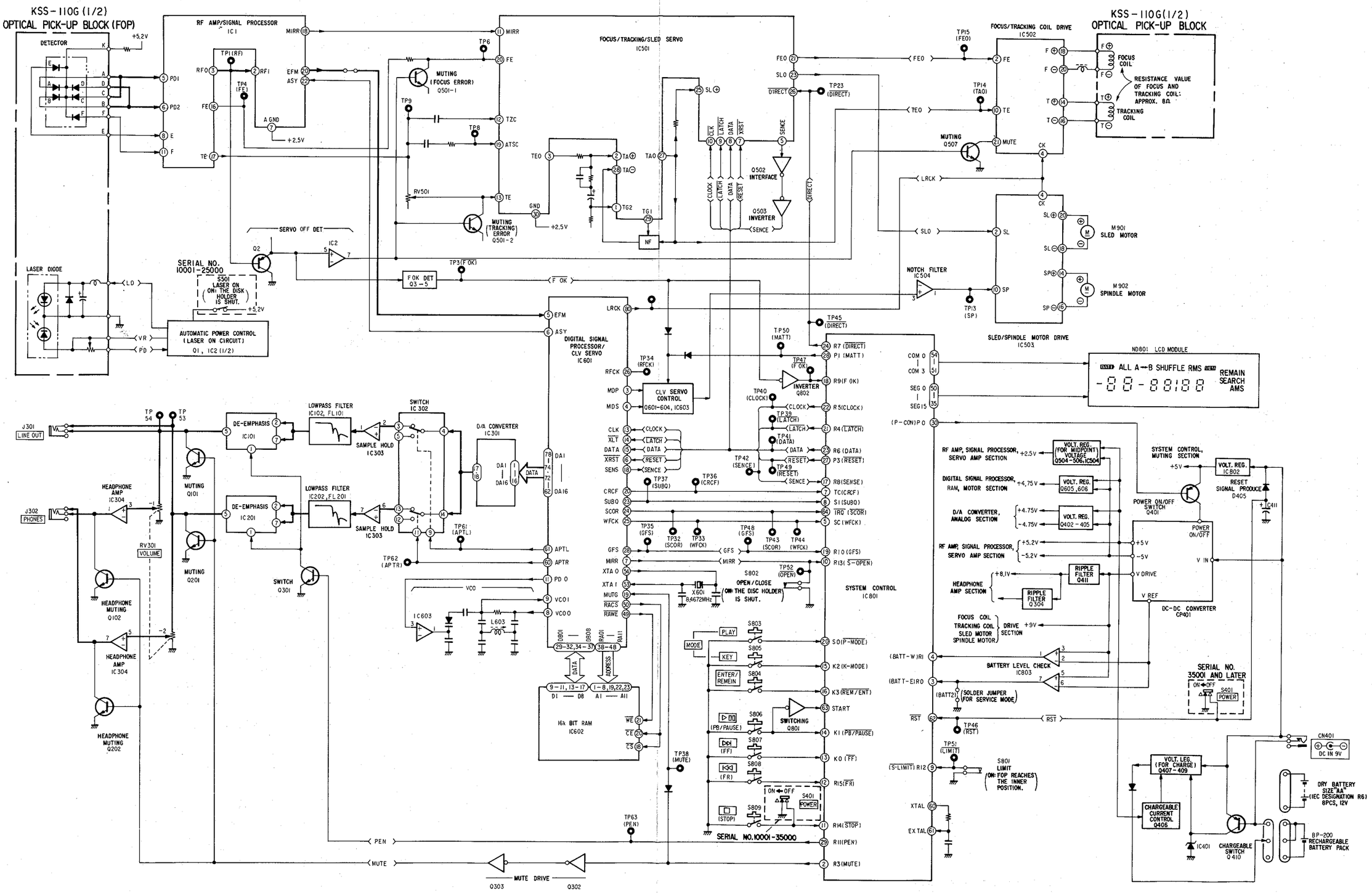



*Fig. B Voltages of Each Part*

- Power voltage is 9 V and fed with regulated dc power supply from DC IN 9V (external power) jack.
  Readings are taken under so-signal conditions with a VOM (50 kΩ/V).
  no mark : stop condition in service mode.
  < > : stop condition on normal operation when POWER SW is ON by connecting a 10 kΩ resistor between pin (1) and pin (3) of CNJ401.
  Voltage variations may be noted due to normal production tolerances.

## 1-2. BLOCK DIAGRAM

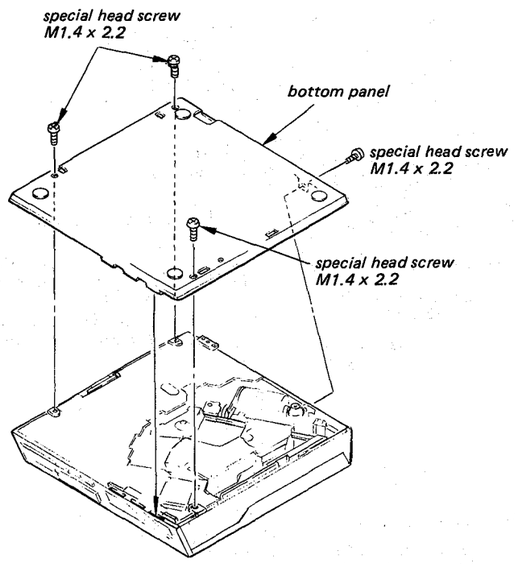


# SECTION 2
# DISASSEMBLY AND REASSEMBLY

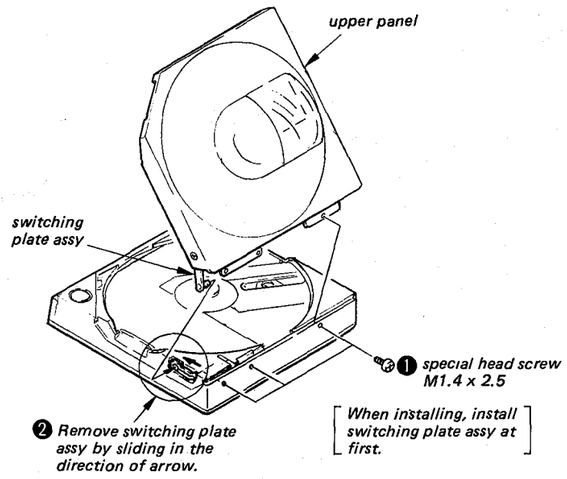
**Note:** Follow the disassembly procedure in the numerical order given.

## 2-1. DISASSEMBLY

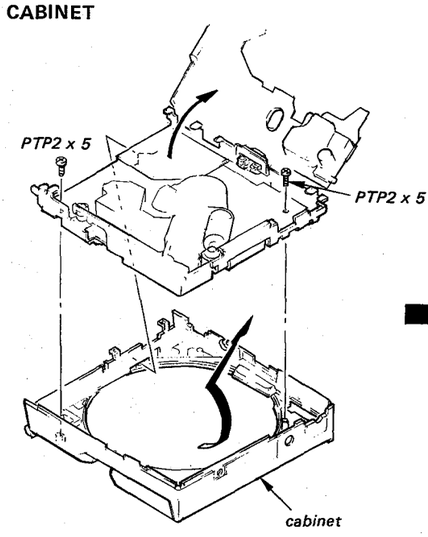
### BOTTOM PANEL




### UPPER PANEL

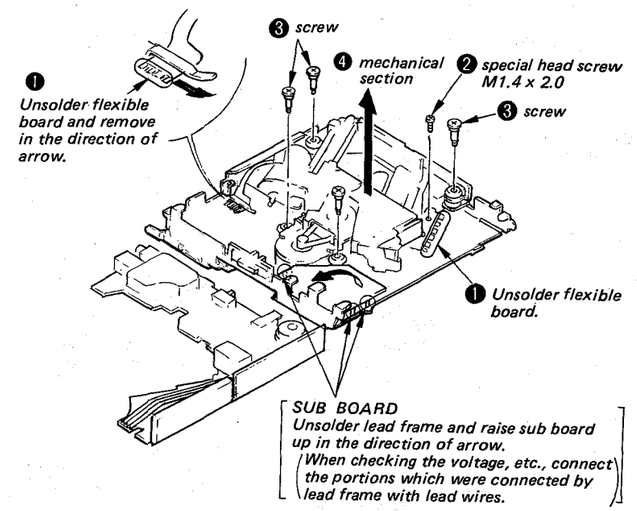



### CABINET

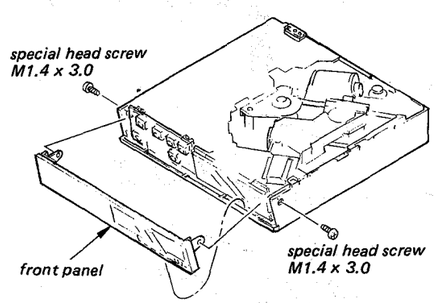



### MECHANICAL SECTION

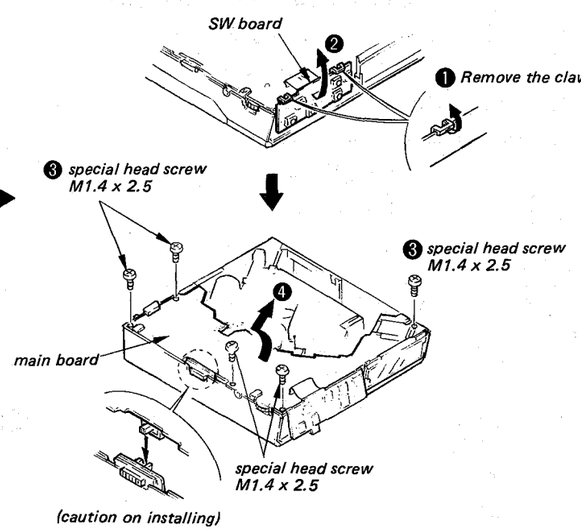
*Note: Be careful not to break flexible board. If it is broken, FOP should be replaced.*



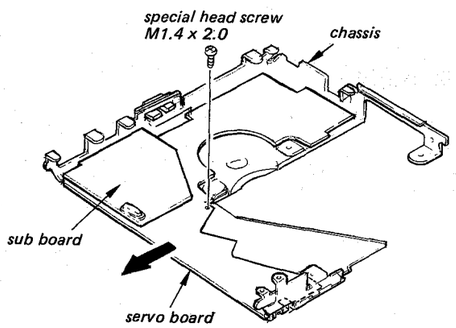

### FRONT PANEL



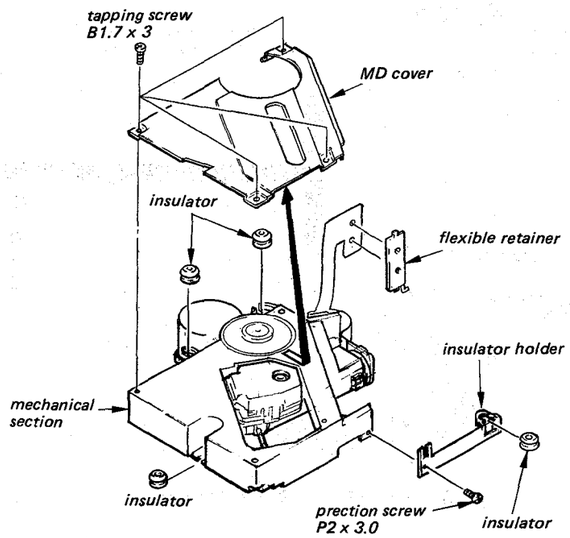

### MAIN BOARD AND SW BOARD




### CHASSIS



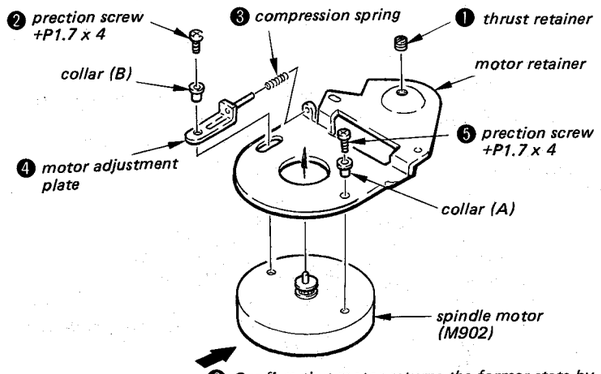

### MD COVER AND INSULATOR



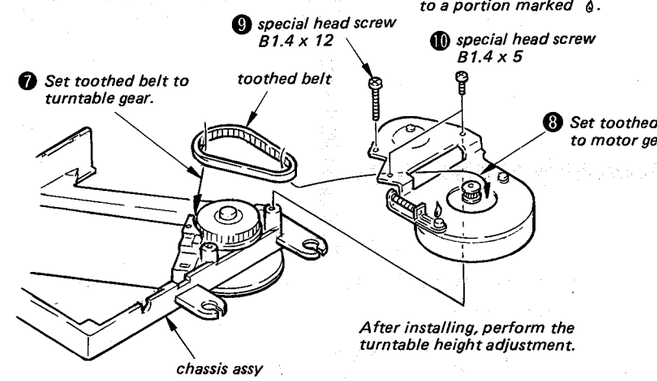
Refer to NOTE ON HADLING THE OPTICAL PICK-UP BLOCK (KSS-110G) on page 3.

## 2-2. MECHANICAL SECTION REASSEMBLY

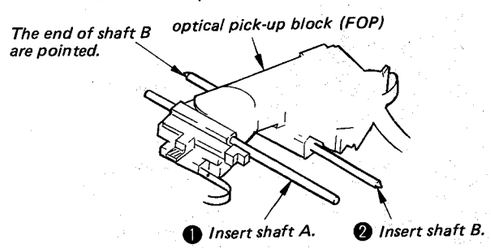
### SPINDLE MOTOR SECTION



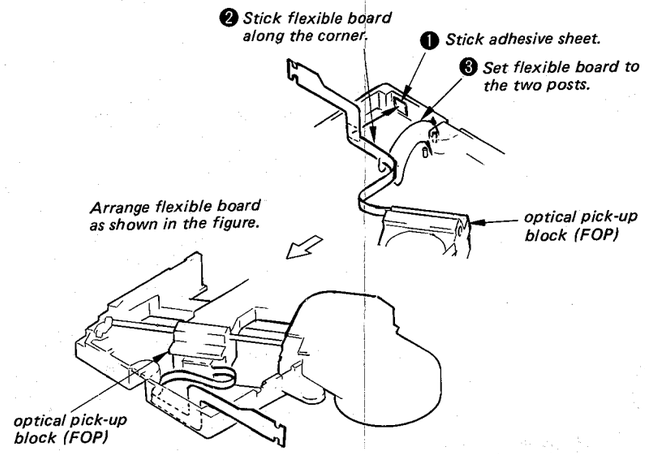

❻ Confirm that motor returns the former state by the force of spring when pushing motor in the direction of arrow.


⓫ Apply a drop of hidro fluid EP-56 (part no. 7-661-018-01) to a portion marked .
❾ special head screw B1.4 x 12
❿ special head screw B1.4 x 5
❼ Set toothed belt to turntable gear.
toothed belt
❽ Set toothed belt to motor gear.
After installing, perform the turntable height adjustment.
chassis assy

### SHAFTS A, B

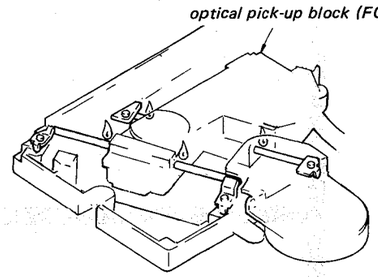



### FLEXIBLE BOARD ARRANGEMENT

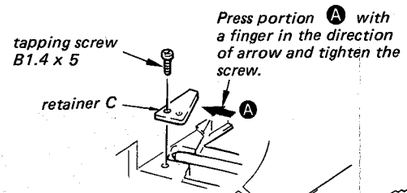

❷ Stick flexible board along the corner.
❶ Stick adhesive sheet.
❸ Set flexible board to the two posts.
optical pick-up block (FOP)
Arrange flexible board as shown in the figure.
optical pick-up block (FOP)

### OIL SUPPLY OF SHAFTS A, B

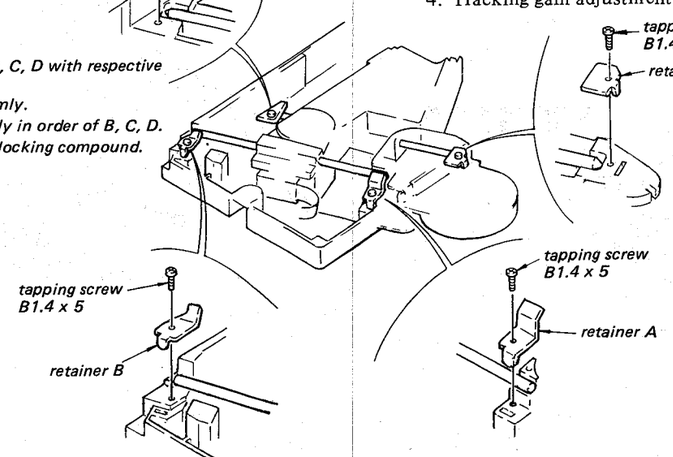
❶ Apply a drop of hydro fluid EP-56 (part no. 7-661-018-01) to four portions marked .
❷ Move FOP right and left two or three times to smooth them.
❸ Lift up mechanical section and incline it in the right or left direction. Confirm that FOP is moved smoothly with itself-weight.




### OPTICAL PICK-UP BLOCK (FOP)



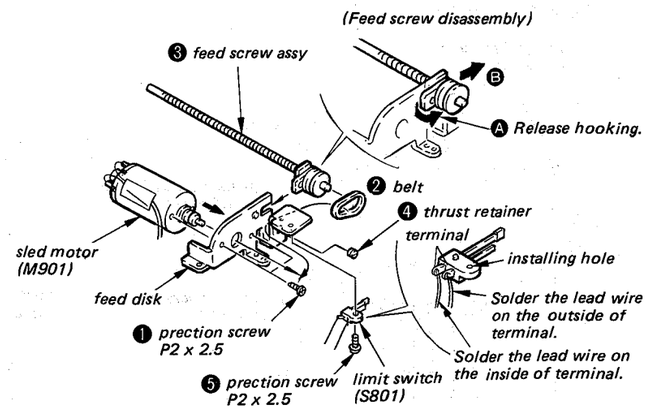

❶ Tighten retainers A, B, C, D with respective screws temporarily.
❷ Tighten retainer A firmly.
❸ Tighten retainers firmly in order of B, C, D.
❹ Lock the screws with locking compound.

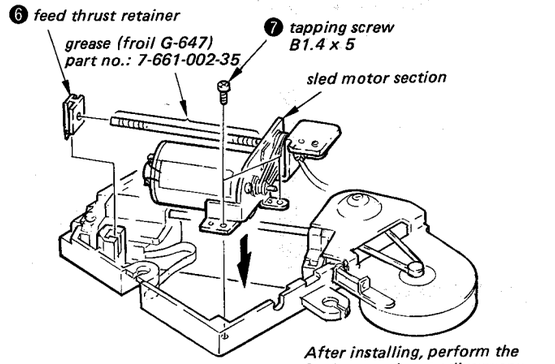



**When replacing optical pick-up block, confirm and adjust the following items in the numerical order given.**

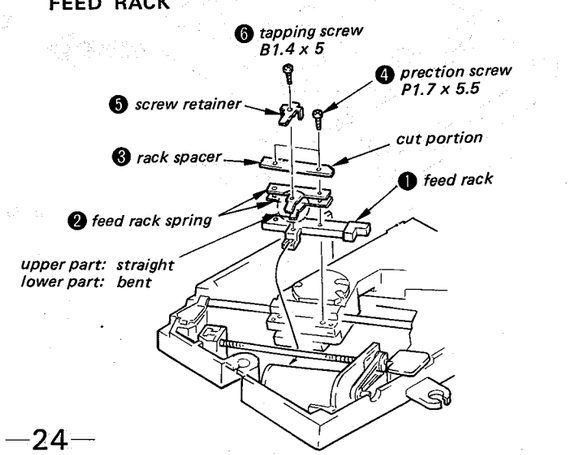
1. Tracking balance adjustment (page 29)
2. Sled motor offset adjustment (page 29)
3. Focus bias adjustment (page 28)
4. Tracking gain adjustment (page 29)

### SLED MOTOR SECTION





❻ feed thrust retainer
grease (froil G-647) part no.: 7-661-002-35
❼ tapping screw B1.4 x 5
sled motor section
After installing, perform the feed screw thrust adjustment.

### FEED RACK



## 2-3. OPTICAL PICK-UP BLOCK (FOP) REPLACEMENT

Optical pick-up block (FOP) can be repaired without removing mechanical section the replacing method is explained below.

**Disassembly:**

Remove bottom panel.
(See page 21.)

↓

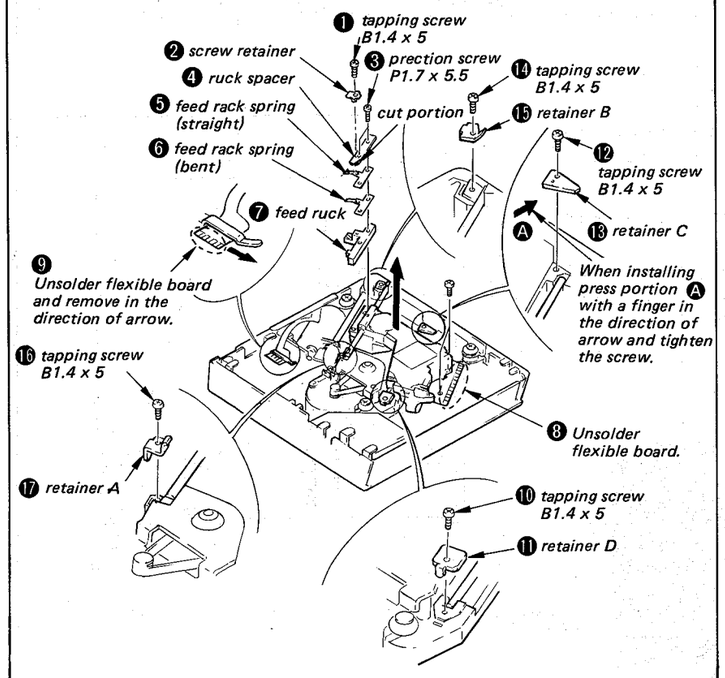
Remove front panel.
(See page 21.)

↓

Remove main board and SW board.
(See page 21.)

↓

Remove optical pick-up block (FOP)


❶ tapping screw B1.4 x 5
❷ screw retainer
❸ prection screw P1.7 x 5.5
❹ ruck spacer
❺ feed rack spring (straight)
cut portion
❻ feed rack spring (bent)
❼ feed ruck
❽ Unsolder flexible board.
❾ Unsolder flexible board and remove in the direction of arrow.
❿ tapping screw B1.4 x 5
⓫ retainer D
⓬ tapping screw B1.4 x 5
⓭ retainer C
⓮ tapping screw B1.4 x 5
⓯ retainer B
⓰ tapping screw B1.4 x 5
⓱ retainer A
Ⓐ When installing press portion Ⓐ with a finger in the direction of arrow and tighten the screw.

↓

Remove shafts A, B from optical pick-up block (FOP). (See page 23 "MECHANICAL SECTION REASSEMBLY.)

**Installation:**

Insert shafts A, B to optical pick-up block (FOP). (See page 23.)

↓

Install optical pick-up block (FOP).
(Installing procedure is opposite to disassembly procedure indicated in the light figure.)

**Note:**
- Arrange flexible board before installing retainers A, B, C, D. (See page 23.)
- Oil shafts A, B. (See page 23.)

↓

Install main board and SW board.

↓

Install front panel.

↓

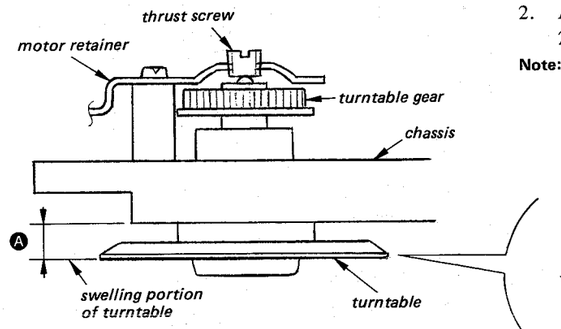
Install bottom panel.

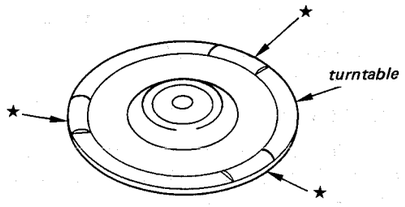


# SECTION 3
# ADJUSTMENTS

## 3-1. MECHANICAL ADJUSTMENTS

### TURNTABLE HEIGHT ADJUSTMENT



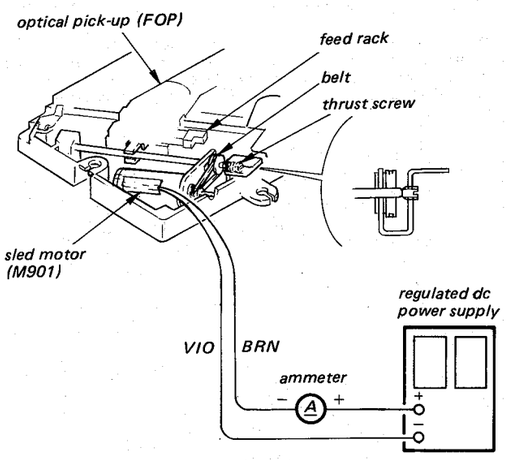

**Procedure:**

1. Lock the thrust screw with locking compound.
2. Adjust thrust screw so that the clearance Ⓐ is 2.7 ±0.05 mm.

**Note:** Be careful not to turn the thrust screw too tightly when tightening, or the height will change when the screwdriver is removed.

### FEED SCREW THRUST ADJUSTMENT

Power supply voltage: 2.5 ±0.1 V




**Procedure:**

1. Remove feed rack and connect as shown in the figure.
2. Lock the thrust screw with locking compound.
3. Read current value under no-lead condition.
4. Tighten thrust screw so that the ammeter reads 100 ±20 mA.
5. Losen thrust screw so that the ammeter reading is 5 – 10 mA more than the reading in step 3.

   **Note:** Be careful not to turn the thrust screw too tightly when tightening, or the current value will change when the screwdriver is removal.
6. Install feed rack and move FOP from the inner to the outer circumference and from the outer to the inner circumference.
   Check that the current value is $70^{+30}_{-20}$ mA at this time.

   In oder to move FOP from the inner to the outer circumference, connect VIO lead to the positive, BRN lead to the negative.
   In oder to move FOP from the outer to the inner circumference, connect BRN lead to the positive, VIO lead to the negative.

## 3-2. ELECTRICAL ADJUSTMENTS

**Notes on Adjustment**

1. Perform adjustments in service mode.
   Be sure to release service mode after completing adjustment.
   (Refer to "Service Mode (service program)" on page 7 – 9.)
2. Perform adjustments in the order given.
3. Use YEDS-1 disc unless otherwise indicated.
4. Power supply voltage: DC 9 V
   Power switch: ON

### PREPARATION

Put the set into service mode (see page 7 – 9) and perform the following checks. Repair if there are any abnormalities.

- **Sled Motor Check**

1. Press the OPEN button and open the top panel.
2. Press the ▶▶|, |◀◀ keys and make sure that the FOP moves smoothly, without catching, from the inmost → outmost → inmost circumference.
   ▶▶|: FOP moves outward
   |◀◀: FOP moves inward

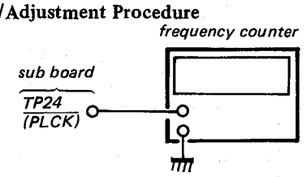
[If FOP moves to innermost circumference or outermost circumference, the feed screw assy and feed rack may stick together and stopmoving. If this occurs, move pulley section of feed screw assy by hand to move FOP.]

- **Focus Search Check**

1. Press the OPEN button and open the top panel.
2. Press the ▶/❚❚ key. (Focus search is performed continuously. Laser does not emit.)
3. Observe the FOP objective lens and check that it moves smoothly up and down with no catching or noises.
4. Press the ■ key.
   Check that focus search operation stops. If it does not, press the ■ key again, longer.

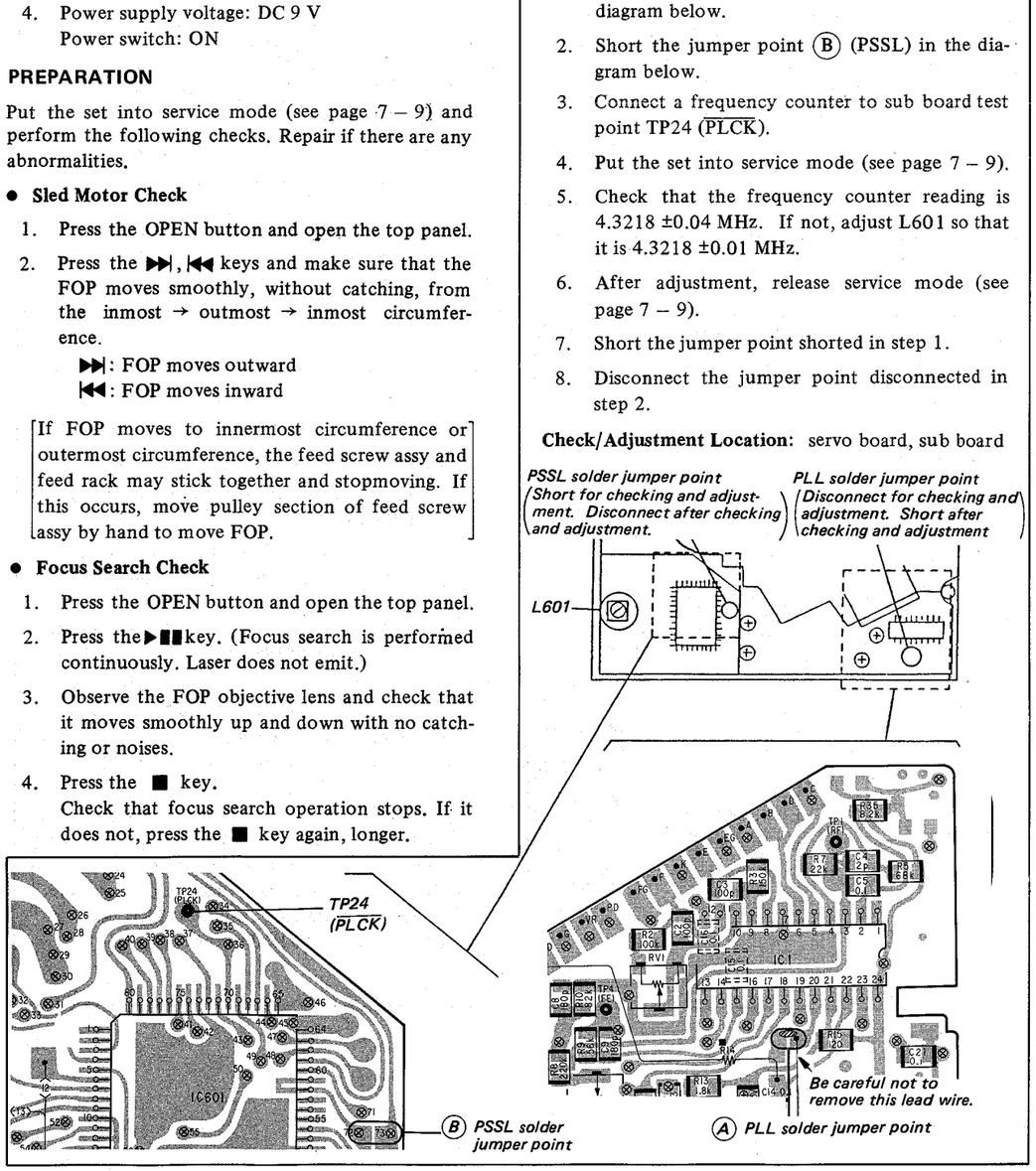
### PLL FREE RUN FREQUENCY CHECK AND ADJUSTMENT

**Check/Adjustment Procedure**




1. Disconnect the jumper point (A) (PLL) in the diagram below.
2. Short the jumper point (B) (PSSL) in the diagram below.
3. Connect a frequency counter to sub board test point TP24 (PLCK).
4. Put the set into service mode (see page 7 – 9).
5. Check that the frequency counter reading is 4.3218 ±0.04 MHz. If not, adjust L601 so that it is 4.3218 ±0.01 MHz.
6. After adjustment, release service mode (see page 7 – 9).
7. Short the jumper point shorted in step 1.
8. Disconnect the jumper point disconnected in step 2.

**Check/Adjustment Location:** servo board, sub board


PSSL solder jumper point
(Short for checking and adjustment. Disconnect after checking and adjustment.
PLL solder jumper point
(Disconnect for checking and adjustment. Short after checking and adjustment
L601
TP24
(PLCK)
IC601
(B) PSSL solder jumper point
Be careful not to remove this lead wire.
(A) PLL solder jumper point

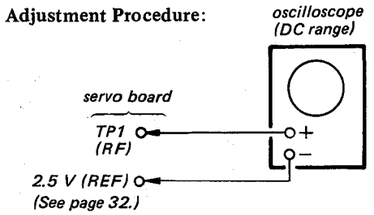


### FOCUS BIAS ADJUSTMENT

**Conditions**

The set should be placed either vertically or horizontally.

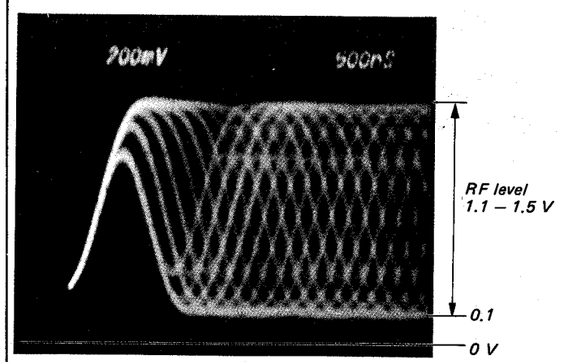
**Adjustment Procedure:**




1. Put the set into service mode (see page 7 – 9).
2. Connect the oscilloscope to servo board test point TP1 (RF).
3. Press the ▶▶| and |◀◀ keys to move the FOP to the center. (Move the FOP to the music area on the disc to enable easy visibility of the eye pattern).
4. Insert the disc (YEDS-1) and close the top panel.
5. Press the ▶/❚❚ key. (Perform focus search.)
6. Rotate spindle motor. (See page 9.)
   (It will go from focus search to focus on, and CLV pull-in mode state. Tracking and sled are OFF.)
7. Press the KEY-MODE button. (Tracking and sled go ON.)
8. eye pattern is good. A good eye pattern means that the diamond shape (◇) in the center of the waveform can be clearly distinguished.

- **RF Signal Reference Waveform (eye pattern)**

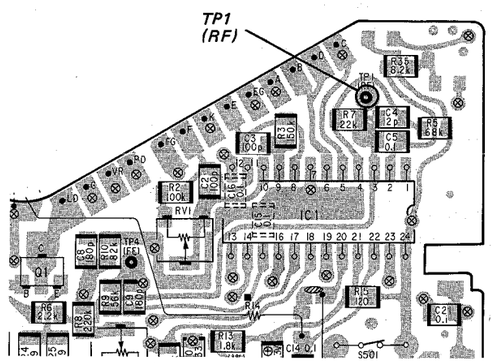
*VOLT/DIV: 200 mV*
*TIME/DIV: 500 nS*

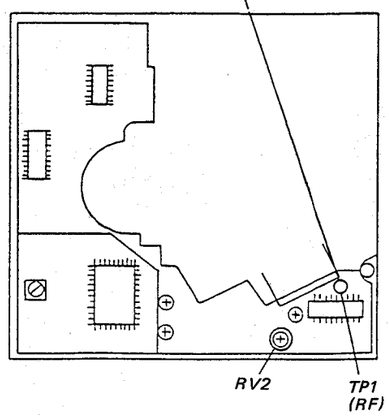



When observing the eye pattern, set the oscilloscope for AC range and raise vertical sensitivity.

8. Press the ■ key. Confirm that disc rotation stops. If not, press the ■ key again, longer.
9. After adjustment, release service mode (see page 7 – 9).

**Adjustment Location:** servo board



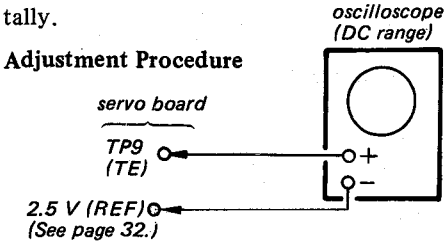



## TRACKING BALANCE ADJUSTMENT

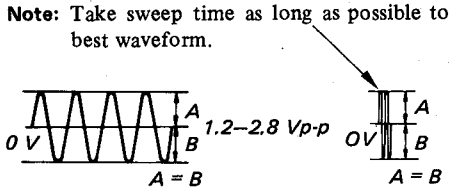
**Conditions**

The set should be placed either vertically or horizontally.

**Adjustment Procedure**

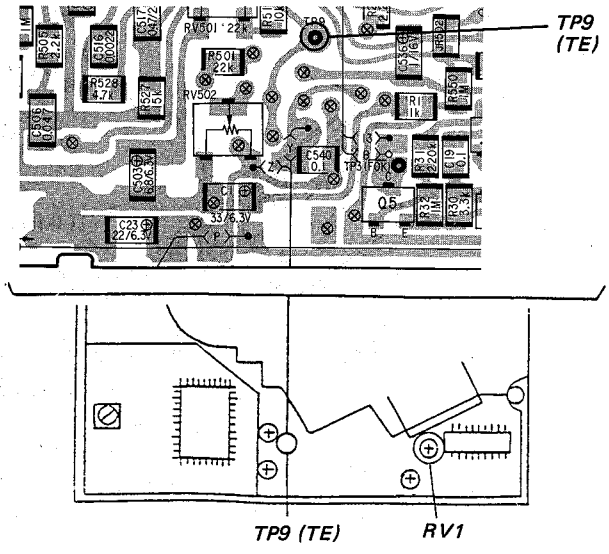



1. Connect the oscilloscope to servo board TP9 (TE).
2. Put the set into service mode (see page 7 – 9).
3. Press the ▶▶| and |◀◀ keys to move the FOP to the center.
4. Insert the disc (YEDS-1) and close the top panel.
5. Press the ▶/■■ key. (Perform focus search.)
6. Rotate spindle motor. (See page 9.)
   (It will go from focus search to focus on, and CLV pull-in mode state. Tracking and sled are OFF.)
7. Adjust RV1 so that the oscilloscope waveform is symmetrical on the top and bottom in relation to 0 V.
   **Note:** Take sweep time as long as possible to obtain best waveform.




8. Press the ■ key. Confirm that disc rotation stops. If it does not, press the ■ key again, longer.
9. After adjustment, release service mode (see page 7 – 9).

**Adjustment Location:** servo board




## SLED MOTOR OFFSET CHECK AND ADJUSTMENT

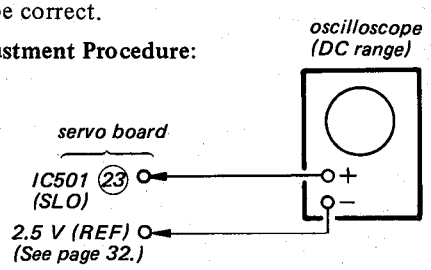
**Conditions**

Tracking balance adjustment should have been finished.

Close the top panel.

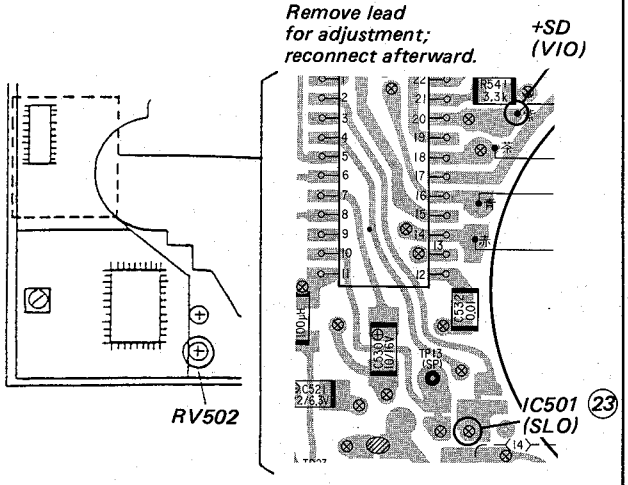
(If the top panel is left open, natural light will enter through the FOP objective lens, and adjustment will not be correct.)

**Adjustment Procedure:**




1. Remove the sled motor +SD lead. (In this adjustment, DC voltage is applied to the tracking amp inside IC501, so this prevents the sled motor from running at abnormal-high speed if RV502 is adjusted too far to the + or – side.)
2. Connect the oscilloscope to servo board IC501 pin (23) (SLO).
3. Put the set into service mode (see page 7 – 9).
4. Press the KEY-MODE button (Tracking and sled go ON.)
5. Adjust RV504 so that the oscilloscope reading is 50 $^{+50}_{-0}$ mV.
6. Press the ■ key.
7. After adjustment, release service mode (see page 7 – 9).
8. Reconnect the sled motor lead removed in step 1.

**Adjustment Location:** servo board



## TRACKING GAIN AJUSTMENT

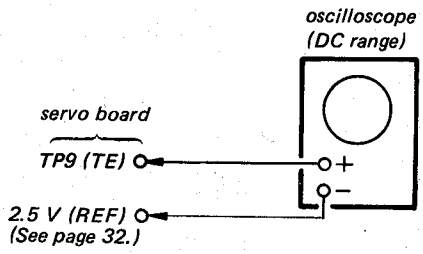
Focus/tracking gain determines the pick-up follow-up (vertical and horizontal) relative to mechanical noise and mechanical shock when the 2-axis device operates.
However, as these reciprocate, the adjustment is at the point where both are satisfied.

- When gain is high, the noise when the 2-axis device operates increases.
- When gain is low, it is more susceptible to mechanical shock and skipping occurs more easily.

This adjustment is to be performed when replacing the following parts:
FOP, RV501 (tracking gain VR). Only tracking gain in adjusted on this set.

**Adjustment Procedure:**

(perform at normal operation)




1. Place the set level, horizontally (upper panel can be facing down). (If the set is not level, the 2-axis device will be weighted and adjustment cannot be done.)
2. Connect the oscilloscope to servo board test point TP9 (TE).
3. Turn the power switch on, insert the disc (YEDS-1) and press the ▶▮▮ key.
4. Turn RV501 slightly clockwise (tracking gain drops) and obtain a waveform with a fundamental wave (waveform has large waves) as in Fig. 9.
5. Turn RV501 slowly counterclockwise (tracking gain rises) until the fundamental wave disappears (no large waves) as in Fig. 10.
6. Set RV501 to the position about 30° counterclockwise from the position obtained in step 5. If RV501 contact point location is within the range shown in Fig. 8 Ⓐ, tracking gain is too high. In this case, readjust from step 4.
7. Select AMS mode with the MODE button, continuously press ▶▶| or |◀◀ key and observe the 100 track jump waveform. Check that no traverse waveform appears for both ▶▶| and |◀◀ directions. (See Figures 11 and 12.) It is acceptable if the traverse waveform appears only now and then, but if it appears constantly, raise tracking gain slightly and check step 7 again.
8. Check that there is not an abnormal amount of operation noise (white noise) from the 2-axis device. If there is, tracking gain is too high, so readjust starting with step 4.

**Adjustment Method:**

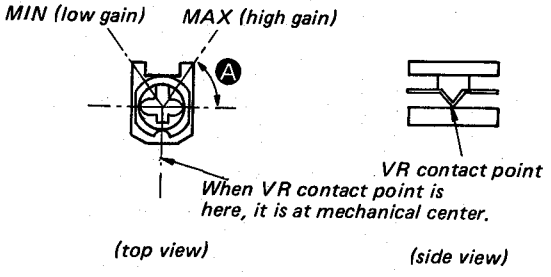



*Fig. 8 Mechanical Center (seen from chip mounted side)*

The waveforms are those measured with the oscilloscope set as shown below.
VOLT/DIV: 1 V
TIME/DIV: 5 mV

- Waveform when tracking gain is lowered.
  Fundamental wave appears (large waves).

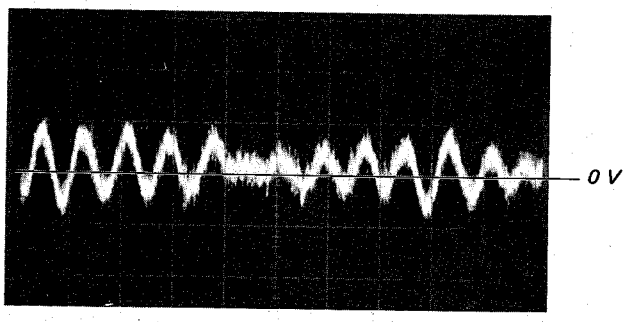



*Fig. 9*

## TRACKING GAIN AJUSTMENT

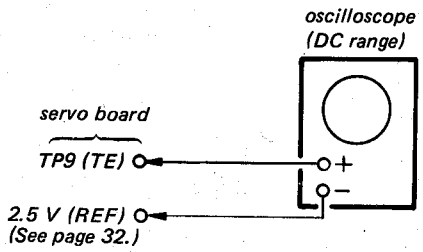
Focus/tracking gain determines the pick-up follow-up (vertical and horizontal) relative to mechanical noise and mechanical shock when the 2-axis device operates.
However, as these reciprocate, the adjustment is at the point where both are satisfied.

- When gain is high, the noise when the 2-axis device operates increases.
- When gain is low, it is more susceptible to mechanical shock and skipping occurs more easily.

This adjustment is to be performed when replacing the following parts:
FOP, RV501 (tracking gain VR). Only tracking gain in adjusted on this set.

**Adjustment Procedure:**

(perform at normal operation)




1. Place the set level, horizontally (upper panel can be facing down). (If the set is not level, the 2-axis device will be weighted and adjustment cannot be done.)
2. Connect the oscilloscope to servo board test point TP9 (TE).
3. Turn the power switch on, insert the disc (YEDS-1) and press the ▶❚❚ key.
4. Turn RV501 slightly clockwise (tracking gain drops) and obtain a waveform with a fundamental wave (waveform has large waves) as in Fig. 9.
5. Turn RV501 slowly counterclockwise (tracking gain rises) until the fundamental wave disappears (no large waves) as in Fig. 10.
6. Set RV501 to the position about 30° counterclockwise from the position obtained in step 5. If RV501 contact point location is within the range shown in Fig. 8 Ⓐ, tracking gain is too high. In this case, readjust from step 4.
7. Select AMS mode with the MODE button, continuously press ▶▶| or |◀◀ key and observe the 100 track jump waveform. Check that no traverse waveform appears for both ▶▶| and |◀◀ directions. (See Figures 11 and 12.) It is acceptable if the traverse waveform appears only now and then, but if it appears constantly, raise tracking gain slightly and check step 7 again.
8. Check that there is not an abnormal amount of operation noise (white noise) from the 2-axis device. If there is, tracking gain is too high, so readjust starting with step 4.

**Adjustment Method:**

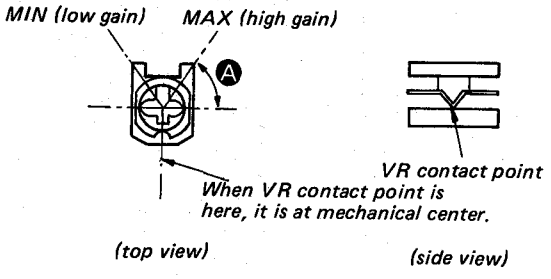



*Fig. 8 Mechanical Center (seen from chip mounted side)*

The waveforms are those measured with the oscilloscope set as shown below.
VOLT/DIV: 1 V
TIME/DIV: 5 mV

- Waveform when tracking gain is lowered.
  Fundamental wave appears (large waves).

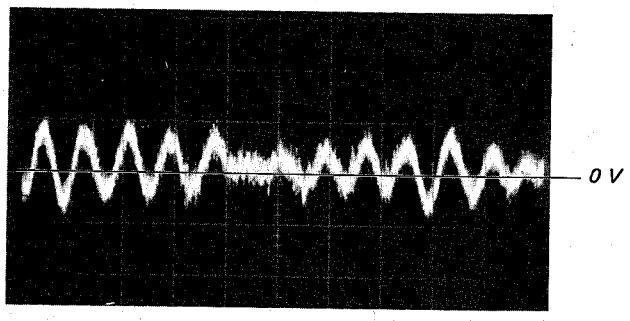



*Fig. 9*

- Waveform when fundamental wave disappears (no large waves).

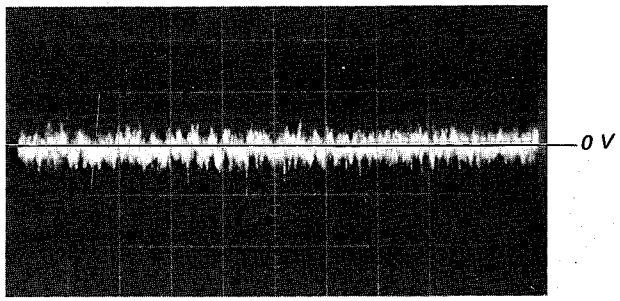



*Fig. 10*

- Waveform with no traverse waveform during 100 track jump. (Brake application is smooth because of adjustment).

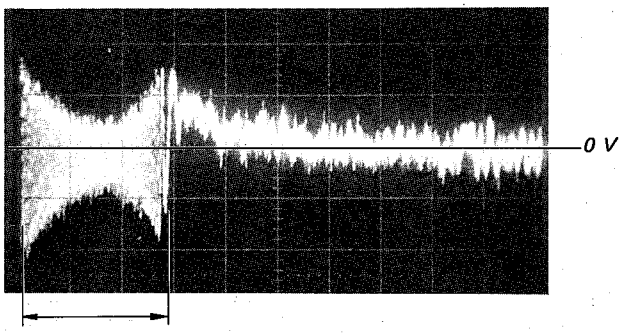



*Fig. 11*

- Waveform with traverse waveform during 100 track jump. (Brake application is poor because of low tracking gain.)

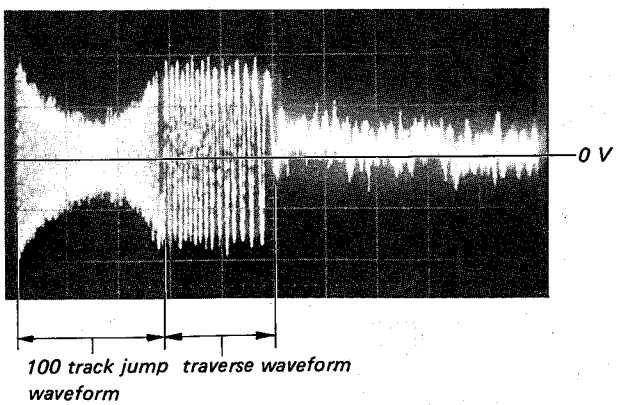
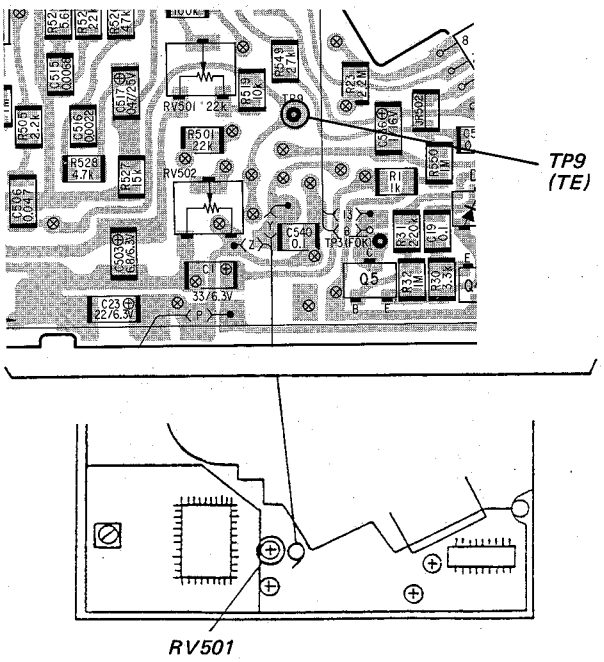



*Fig. 12*

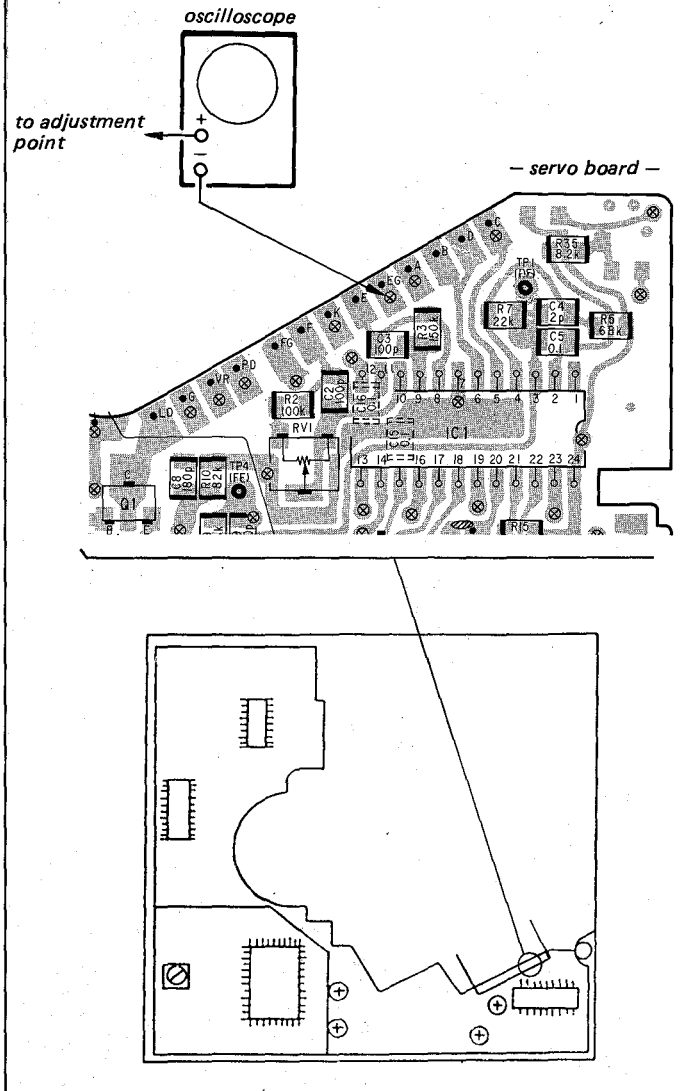
**Adjustment Location:** servo board



- **2.5 V (REF) Connecting Point**

FOCUS BIAS ADJUSTMENT
TRACKING BALANCE ADJUSTMENT
SLED MOTOR OFFSET CHECK AND ADJUSTMENT
TRACKING GAIN ADJUSTMENT

When the adjustments above are performed, connect the ⊖ side of oscilloscope to the point below.

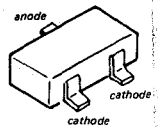




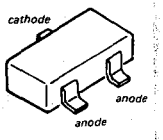

SECTI
DIAGR

- **Semiconduct**

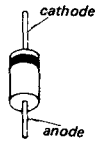
**1S2835**



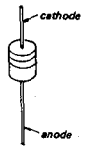

**1S2837**



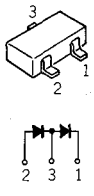

**1SS106**
**RD5.6E-L2**



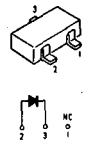

**1SS119**



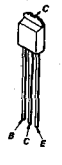

**1SS123**



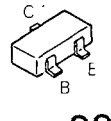

**E10QS03**




**2SA1385**




**2SB624-BV4**
**2SD596**
**DTA124EK**
**DTC114YK**
**DTC124EK**



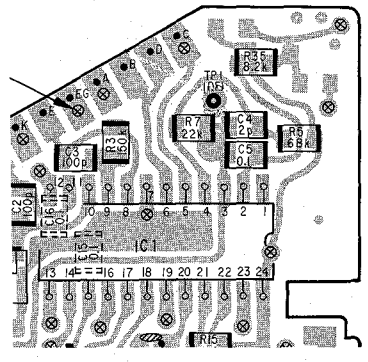
**g Point**

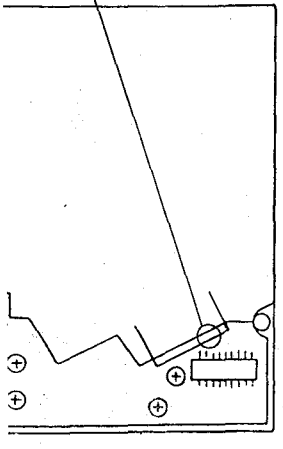
ITMENT
E ADJUSTMENT
ET CHECK AND

)JUSTMENT

above are performed, con-
oscilloscope to the point

*– servo board –*



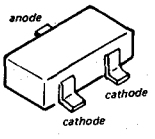




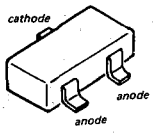
# SECTION 4
# DIAGRAMS

- **Semiconductor Lead Layouts**

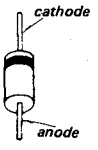
**1S2835**



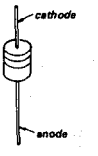

**1S2837**



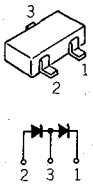

**1SS106**
**RD5.6E-L2**



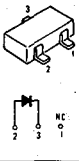

**1SS119**




**1SS123**

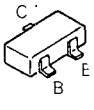



**E10QS03**

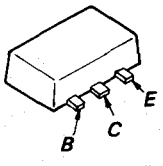



**2SA1385**

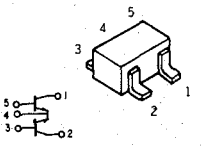
**2SB624-BV4**
**2SD596**
**DTA124EK**
**DTC114YK**
**DTC124EK**



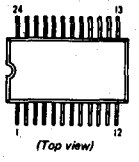

**2SB798**
**2SD999**



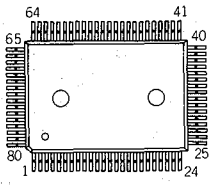

**FMG4**
**FMS1**
**FMW1**



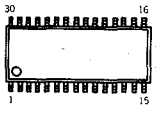

**CX20109**
**HM6116**
**PCM55HP-S**



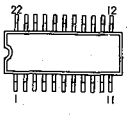

**CX23035**



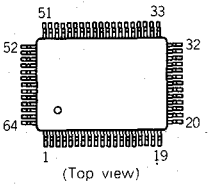

**CXA1023M**



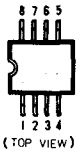

**CXA1083M**



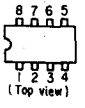

**CXP5024H-001Q**



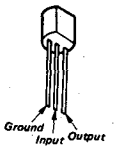

**M5201FP**
**NJM2903M**
**NJM4558M**
**NJM4560M**
**TL082CPS**
**TL72CPS**



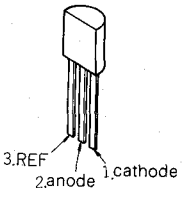

**NJM4556D**



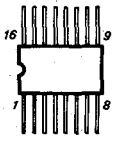

**S-81250HG**




**TC431CLPB**

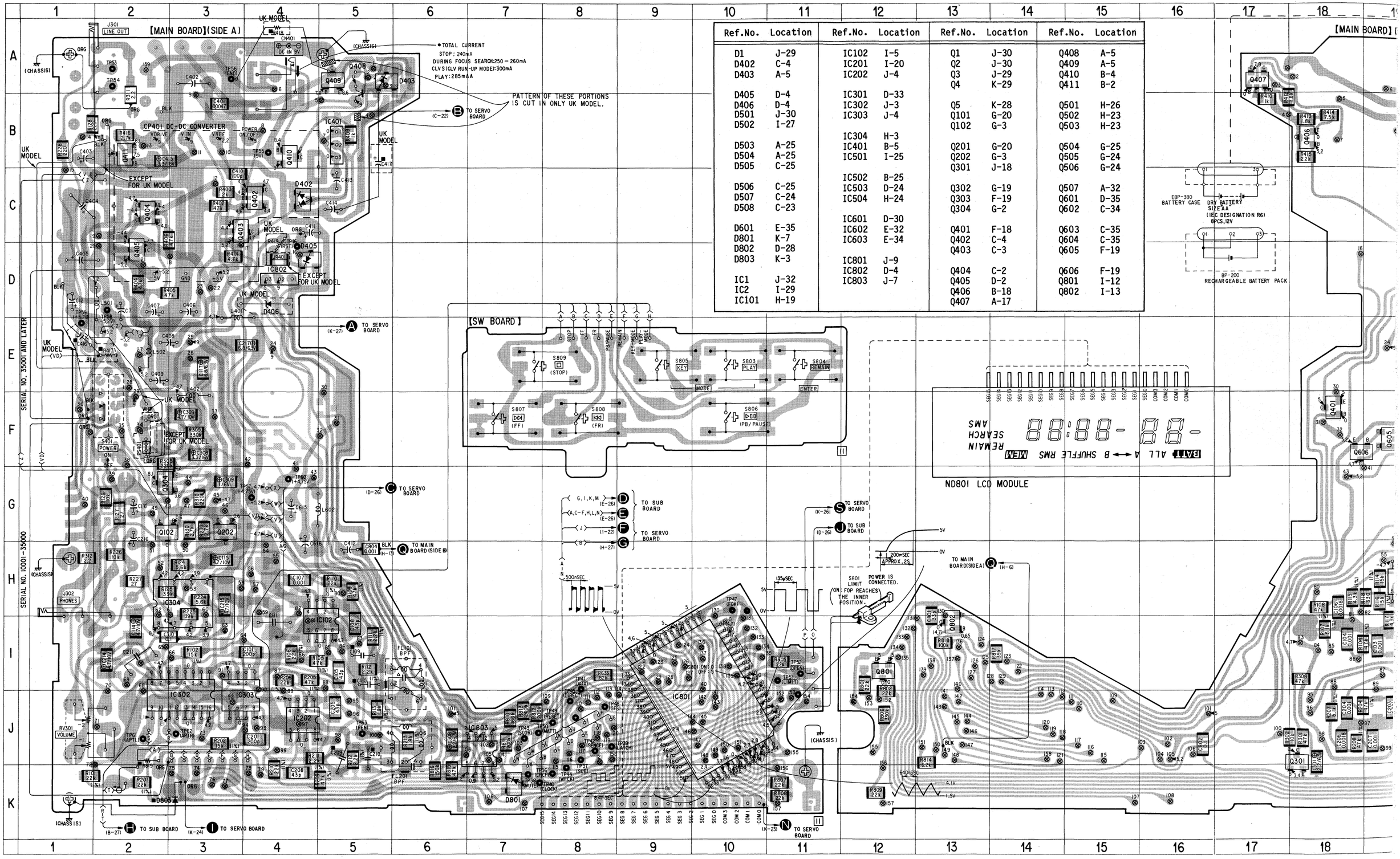



**μPD4053BG**



## 4-1. MOUNTING DIAGRAM

● See page 33 for Semiconductor Lead Layouts.




| Ref.No. | Location | Ref.No. | Location | Ref.No. | Location | Ref.No. | Location |
|---|---|---|---|---|---|---|---|
| D1 | J-29 | IC102 | I-5 | Q1 | J-30 | Q408 | A-5 |
| D402 | C-4 | IC201 | I-20 | Q2 | J-30 | Q409 | A-5 |
| D403 | A-5 | IC202 | J-4 | Q3 | J-29 | Q410 | B-4 |
| | | | | Q4 | K-29 | Q411 | B-2 |
| D405 | D-4 | IC301 | D-33 | | | | |
| D406 | D-4 | IC302 | J-3 | Q5 | K-28 | Q501 | H-26 |
| D501 | J-30 | IC303 | J-4 | Q101 | G-20 | Q502 | H-23 |
| D502 | I-27 | | | Q102 | G-3 | Q503 | H-23 |
| | | IC304 | H-3 | | | | |
| D503 | A-25 | IC401 | B-5 | Q201 | G-20 | Q504 | G-25 |
| D504 | A-25 | IC501 | I-25 | Q202 | G-3 | Q505 | G-24 |
| D505 | C-25 | | | Q301 | J-18 | Q506 | G-24 |
| | | IC502 | B-25 | | | | |
| D506 | C-25 | IC503 | D-24 | Q302 | G-19 | Q507 | A-32 |
| D507 | C-24 | IC504 | H-24 | Q303 | F-19 | Q601 | D-35 |
| D508 | C-23 | | | Q304 | G-2 | Q602 | C-34 |
| | | IC601 | D-30 | | | | |
| D601 | E-35 | IC602 | E-32 | Q401 | F-18 | Q603 | C-35 |
| D801 | K-7 | IC603 | E-34 | Q402 | C-4 | Q604 | C-35 |
| D802 | D-28 | | | Q403 | C-3 | Q605 | F-19 |
| D803 | K-3 | IC801 | J-9 | | | | |
| | | IC802 | D-4 | Q404 | C-2 | Q606 | F-19 |
| IC1 | J-32 | IC803 | J-7 | Q405 | D-2 | Q801 | I-12 |
| IC2 | I-29 | | | Q406 | B-18 | Q802 | I-13 |
| IC101 | H-19 | | | Q407 | A-17 | | |

【SERVO BOARD】(SIDE A)

【SUB BOARD】(SIDE A)

【SUB BOARD】(SIDE B)

【LIMITER BOARD】

**Note on Mounting Diagram:**

- ■ : part mounted on the conductor side.
- ⊗ : Through hole.
- •---• : connection by lead frame or soldering.
- ▒ : side B pattern.
- [ ] : chip component mounted on side B of servo board.

CNJ401 BATTERY TERMINAL

IC502 IC503 IC504 IC501 IC601 IC301 IC602 IC603 IC1 IC2

Q201 Q101 Q502 Q503 Q504 Q505 Q506 Q501 Q502 Q1 Q2 Q3 Q4 Q5 Q604 Q603 Q602 Q601 Q507

D503 D504 D508 D507 D506 D505 D802 D601

M901 SLED MOTOR

M902 SPINDLE MOTOR

TO MAIN BOARD (B-6) BLK

TO SUB BOARD (K-23) (E-23)

TO SUB BOARD (L-27) (F-27)

TO SUB BOARD (O-26) (G-26)

TO SUB BOARD (R-28) (A-28)

TO MAIN BOARD (C-6) (J-12)

TO SERVO BOARD (K-23)

TO MAIN BOARD (E-9) (G-9) (A,C-F,H,L,N)

TO MAIN BOARD (D-9) (G-9) (G,I,K,M)

TO SERVO BOARD (L-22) (J-22)

TO SERVO BOARD (O-22) (K-22)

TO SERVO BOARD (R-25) (F-25)

TO KSS-110G (OPTICAL PICK-UP BLOCK) (F-30)

TO MAIN BOARD (H-2) (K-2)

TO SERVO BOARD (P-27) (G-27)

TO SERVO BOARD (M-27) (B-27)

TO LIMITER BOARD (P-31) (C-31)

TO MAIN BOARD (G-9)

TO MAIN BOARD (F-9) (J-9)

TO MAIN BOARD (S-12) (G-12)

TO MAIN BOARD (A-5) (E-5)

TO MAIN BOARD (N-11) (K-11)

TO MAIN BOARD (I-3) (K-3)

KSS-110G (OPTICAL PICK-UP) BLOCK

FLEXIBLE RETAINER

SERIAL NO. 25001 AND LATER

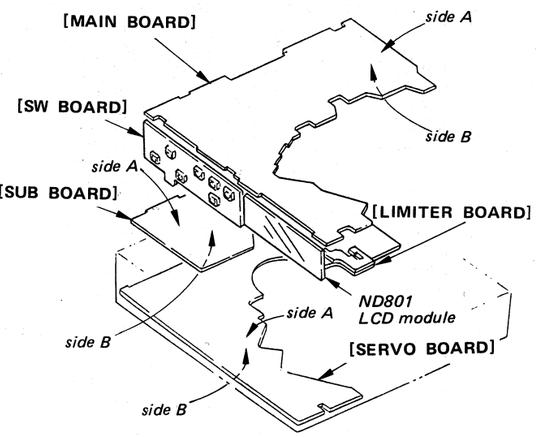
SERIAL NO. 10001 – 25000

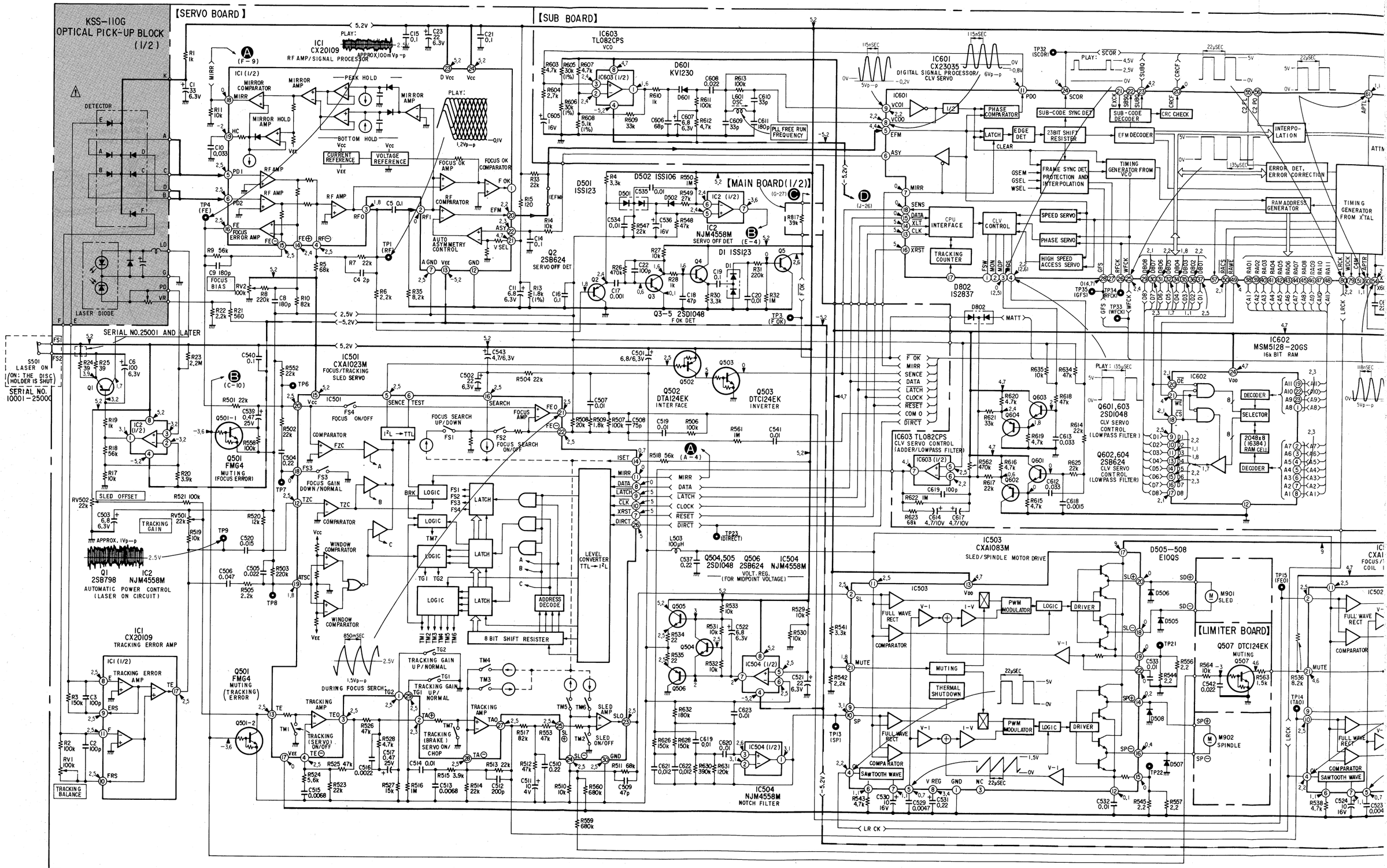
JR504

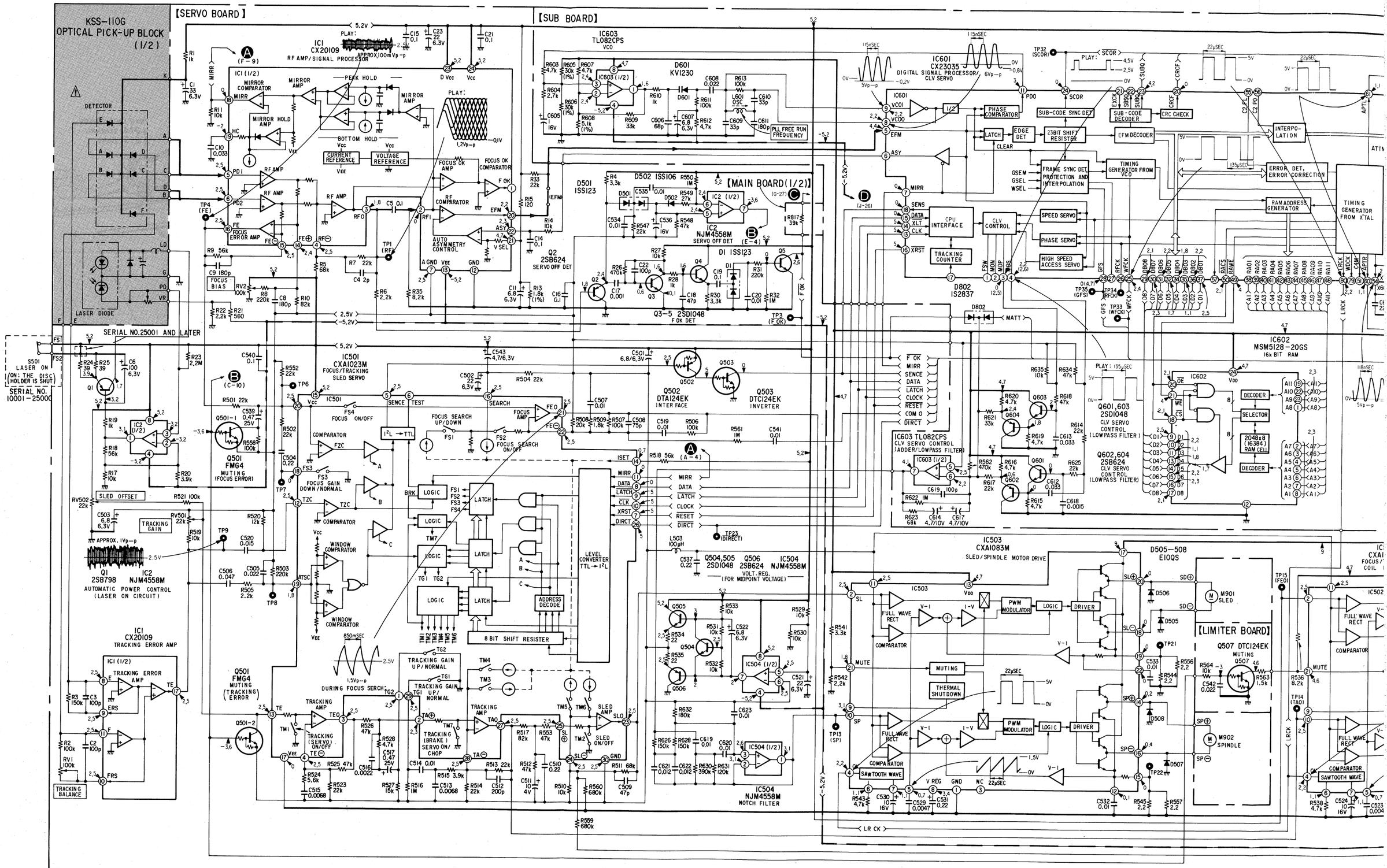
S901 LASER ON (ON: THE DISC HOLDER IS SHUT.)

S902 OPEN/CLOSE (ON: THE DISC HOLDER IS SHUT.)

• *When opening the bottom panel.*




【SERVO BOARD】
【SUB BOARD】
【MAIN BOARD(1/2)】
KSS-110G
OPTICAL PICK-UP BLOCK
(1/2)
DETECTOR
LASER DIODE
SERIAL NO.25001 AND LATER
SERIAL NO. 10001-25000
S501
LASER ON
(ON: THE DISC HOLDER IS SHUT)
IC1
CX20109
RF AMP/SIGNAL PROCESSOR
IC1 (1/2)
MIRROR COMPARATOR
MIRROR AMP
PEAK HOLD
BOTTOM HOLD
MIRROR HOLD AMP
CURRENT REFERENCE
VOLTAGE REFERENCE
RF AMP
FOCUS OK AMP
FOCUS OK COMPARATOR
RF COMPARATOR
AUTO ASYMMETRY CONTROL
FOCUS ERROR AMP
FOCUS BIAS
IC603
TL082CPS
VCO
D601
KV1230
PLL FREE RUN FREQUENCY
D501
ISS123
D502 ISS106
IC2 (1/2)
IC2
NJM4558M
SERVO OFF DET
Q2
2SB624
SERVO OFF DET
DI ISS123
Q3-5 2SD1048
F OK DET
IC601
CX23035
DIGITAL SIGNAL PROCESSOR/ CLV SERVO
PHASE COMPARATOR
SUB-CODE SYNC DET
SUB-CODE DECODER
CRC CHECK
LATCH
EDGE DET
23BIT SHIFT RESISTOR
EFM DECODER
INTERPO-LATION
FRAME SYNC DET, PROTECTION AND INTERPOLATION
TIMING GENERATOR FROM VCO
ERROR DET, ERROR CORRECTION
RAM ADDRESS GENERATOR
TIMING GENERATOR FROM X'TAL
CPU INTERFACE
CLV CONTROL
SPEED SERVO
PHASE SERVO
HIGH SPEED ACCESS SERVO
TRACKING COUNTER
D802
IS2837
MATT
IC602
MSM5128-20GS
16k BIT RAM
DECODER
SELECTOR
2048x8 (16384) RAM CELL
Q601,603
2SD1048
CLV SERVO CONTROL (LOWPASS FILTER)
Q602,604
2SB624
CLV SERVO CONTROL (LOWPASS FILTER)
IC603 TL082CPS
CLV SERVO CONTROL (ADDER/LOWPASS FILTER)
IC501
CXA1023M
FOCUS/TRACKING SLED SERVO
Q501
FMG4
MUTING (FOCUS ERROR)
Q502
DTA124EK
INTER FACE
Q503
DTC124EK
INVERTER
SLED OFFSET
TRACKING GAIN
TRACKING BALANCE
Q1
2SB798
IC2
NJM4558M
AUTOMATIC POWER CONTROL (LASER ON CIRCUIT)
APPROX. 1Vp-p
2.5V
FOCUS SEARCH UP/DOWN
FOCUS ON/OFF
FOCUS SEARCH ON/OFF
FOCUS GAIN DOWN/NORMAL
COMPARATOR
WINDOW COMPARATOR
I²L → TTL
LEVEL CONVERTER TTL → I²L
LOGIC
LATCH
ADDRESS DECODE
8 BIT SHIFT RESISTER
TRACKING GAIN UP/NORMAL
TRACKING (BRAKE) SERVO ON/ CHOP
TRACKING (SERVO) ON/OFF
TRACKING AMP
SLED AMP
SLED ON/OFF
IC1
CX20109
TRACKING ERROR AMP
Q501
FMG4
MUTING (TRACKING ERROR)
IC503
CXA1083M
SLED/SPINDLE MOTOR DRIVE
D505—508
E10QS
FULL WAVE RECT
COMPARATOR
SAWTOOTH WAVE
PWM MODULATOR
LOGIC
DRIVER
MUTING
THERMAL SHUTDOWN
M901
SLED
M902
SPINDLE
【LIMITER BOARD】
Q507
DTC124EK
MUTING
IC504
NJM4558M
NOTCH FILTER
Q504,505
2SD1048
Q506
2SB624
VOLT. REG. (FOR MIDPOINT VOLTAGE)
IC504
NJM4558M
LR CK
LRCK


【SERVO BOARD】
【SUB BOARD】
【MAIN BOARD(1/2)】
【LIMITER BOARD】
KSS-110G
OPTICAL PICK-UP BLOCK
(1/2)
DETECTOR
LASER DIODE
SERIAL NO.25001 AND LATER
SERIAL NO.
10001-25000
S501
LASER ON
(ON: THE DISC
HOLDER IS SHUT)
IC1
CX20109
RF AMP/SIGNAL PROCESSOR
IC1 (1/2)
MIRROR COMPARATOR
MIRROR AMP
PEAK HOLD
BOTTOM HOLD
MIRROR HOLD AMP
CURRENT REFERENCE
VOLTAGE REFERENCE
RF AMP
FOCUS ERROR AMP
FOCUS BIAS
FOCUS OK AMP
RF COMPARATOR
AUTO ASYMMETRY CONTROL
IC603
TL082CPS
VCO
D601
KV1230
Q2
2SB624
SERVO OFF DET
D501
ISS123
D502 ISS106
IC2
NJM4558M
SERVO OFF DET
Q3-5 2SD1048
F OK DET
D1 ISS123
IC601
CX23035
DIGITAL SIGNAL PROCESSOR/
CLV SERVO
PHASE COMPARATOR
SUB-CODE SYNC DET
SUB-CODE DECODER
CRC CHECK
LATCH
EDGE DET
23BIT SHIFT RESISTER
EFM DECODER
INTERPO-LATION
FRAME SYNC DET, PROTECTION AND INTERPOLATION
TIMING GENERATOR FROM VCO
ERROR DET, ERROR CORRECTION
RAM ADDRESS GENERATOR
TIMING GENERATOR FROM X'TAL
CPU INTERFACE
CLV CONTROL
SPEED SERVO
PHASE SERVO
HIGH SPEED ACCESS SERVO
TRACKING COUNTER
D802
IS2837
MATT
IC602
MSM5128-20GS
16k BIT RAM
DECODER
SELECTOR
2048x8 (16384) RAM CELL
IC603 TL082CPS
CLV SERVO CONTROL (ADDER/LOWPASS FILTER)
Q601,603
2SD1048
CLV SERVO CONTROL (LOWPASS FILTER)
Q602,604
2SB624
CLV SERVO CONTROL (LOWPASS FILTER)
IC501
CXA1023M
FOCUS/TRACKING SLED SERVO
Q501
FMG4
MUTING (FOCUS ERROR)
Q502
DTA124EK
INTER FACE
Q503
DTC124EK
INVERTER
FOCUS ON/OFF
FOCUS SEARCH UP/DOWN
FOCUS SEARCH ON/OFF
FOCUS GAIN DOWN/NORMAL
COMPARATOR
WINDOW COMPARATOR
I²L → TTL
LEVEL CONVERTER TTL → I²L
LOGIC
LATCH
ADDRESS DECODE
8 BIT SHIFT RESISTER
SLED OFFSET
TRACKING GAIN
APPROX. 1Vp-p
2.5V
Q1
2SB798
IC2
NJM4558M
AUTOMATIC POWER CONTROL
(LASER ON CIRCUIT)
IC1
CX20109
TRACKING ERROR AMP
TRACKING BALANCE
Q501
FMG4
MUTING
(TRACKING ERROR)
850mSEC
1.5Vp-p
DURING FOCUS SERCH
TRACKING GAIN UP/NORMAL
TRACKING (BRAKE) SERVO ON/ CHOP
TRACKING (SERVO) ON/OFF
TRACKING AMP
SLED AMP
SLED ON/OFF
IC503
CXA1083M
SLED/SPINDLE MOTOR DRIVE
D505-508
E10QS
PWM MODULATOR
LOGIC
DRIVER
FULL WAVE RECT
COMPARATOR
SAWTOOTH WAVE
MUTING
THERMAL SHUTDOWN
M901
SLED
M902
SPINDLE
Q507
DTC124EK
MUTING
IC504
NJM4558M
NOTCH FILTER
Q504,505
2SD1048
Q506
2SB624
IC504
NJM4558M
VOLT. REG.
(FOR MIDPOINT VOLTAGE)
L503
100μH
L501
OSC
L601
OSC
LR CK
LRCK

【MAIN BOARD(1/2)】

IC302 μPD4053BG SWITCH

IC301 PCM55-S D/A CONVERTER

IC303 TL072CPS SAMPLE HOLD

IC102,202 NJM4560M LOWPASS FILTER

IC101,201 M5201FP DE-EMPHASIS

Q101,201 2SD1048 MUTING

Q301 DTC124EK SWITCH

IC304 NJM4556D HEADPHONE AMP

Q102,202 2SD1048 HEADPHONE MUTING

Q802 DTC114YK INVERTER

Q801 DTA124EK SWITCHING

Q302 DTC124EK — MUTING DRIVE

Q303 DTA124EK

IC802 S81250HG VOLT. REG.

D405 IS2835 RESET SIGNAL PRODUCE

Q304,411 2SD1048 RIPPLE FILTER

Q606 Q605 2SB624 FMWI VOLT. REG.

Q403 Q402 2SB798 FMWI — VOLT. REG.

Q401 DTA124EK POWER ON/OFF SWITCH

IC803 NJM2903M BATTERY LEVEL CHECK

CP401 DC-DC CONVERTER

Q410 DTA124EK CHARGEABLE SWITCH

D403 E10QS

Q406 2SB624 CHARGEABLE CURRENT CONTROL

Q407 FMWI — VOLT. REG. (FOR CHARGE)

Q408 2SAI358

Q409 2SB624

D402 IS2835

IC401 TL431CLPB

Q404 Q405 FMSI 2SD999 — VOLT. REG.

IC801 CXP5024H-001Q SYSTEM CONTROL

IC502 CXA1083M FOCUS/TRACKING COIL DRIVE

KSS-110G OPTICAL PICK-UP BLOCK(1/2)

FOCUS COIL

RESISTANCE VALUE OF FOCUS/TRACKING COIL: APPROX. 8Ω

TRACKING COIL

ND801 LCD MODULE

【SW BOARD】

【LIQUID CRYSTAL MODULE】

J301 LINE OUT

J302 PHONES

CN401 DC IN 9V

DRY BATTERY SIZE "AA" (IEC DESIGNATION R6) 8PCS, 12V

EBP-380 BATTERY CASE

BP-200 RECHARGEABLE BATTERY PACK

TOTAL CURRENT STOP: 240mA DURING FOCUS SEARCH: 250—260mA CLV S(CLV RUN-UP MODE): 300mA PLAY: 285mA

**Note on Schematic Diagram:**

- All capacitors are in μF unless otherwise noted. pF: μμF 50WV or less are not indicated except for electrolytics and tantalums.
- All resistors are in Ω and ¼ W or less unless otherwise specified.
- ——▶—— : signal path.
- Components for right channel have same values as for left channel. Reference numbers are coded from 200.
- △ : internal component.
- ▬▬ : B+ bus.
- ▬ ▬ ▬ : B− bus.
- ▭ : adjustment for repair.
- Voltages, waveform and total current are measured with top panel closed.
- Power voltage is DC 9 V and fed with regulated dc power supply from DC in 9 V (external power voltage) jack.
  Voltages are DC with respect to ground in service mode.
  Voltage variations may be noted due to normal production tolerances.
  no mark: stop mode
  ( ) : play mode
- Waveforms are taken to ground in service mode by using oscilloscope.
  Voltage variations may be noted due to normal production tolerances.
- Total current is measured in service mode.
- Switch

| Ref. No. | Switch | Position |
|---|---|---|
| S401 | POWER | OFF |
| S501 | LASER ON | ON |
| S801 | LIMIT | OFF |
| S802 | OPEN/CLOSE | ON |
| S803 | PLAY-MODE | OFF |
| S804 | REMAIN/ENTER | OFF |
| S805 | KEY-MODE | OFF |
| S806 | ▶II (PLAY/PAUSE) | OFF |
| S807 | ▶▶I (FF) | OFF |
| S808 | I◀◀ (FR) | OFF |
| S809 | ■ (STOP) | OFF |

See page 7 — 9 for setup of service mode.

**Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.**

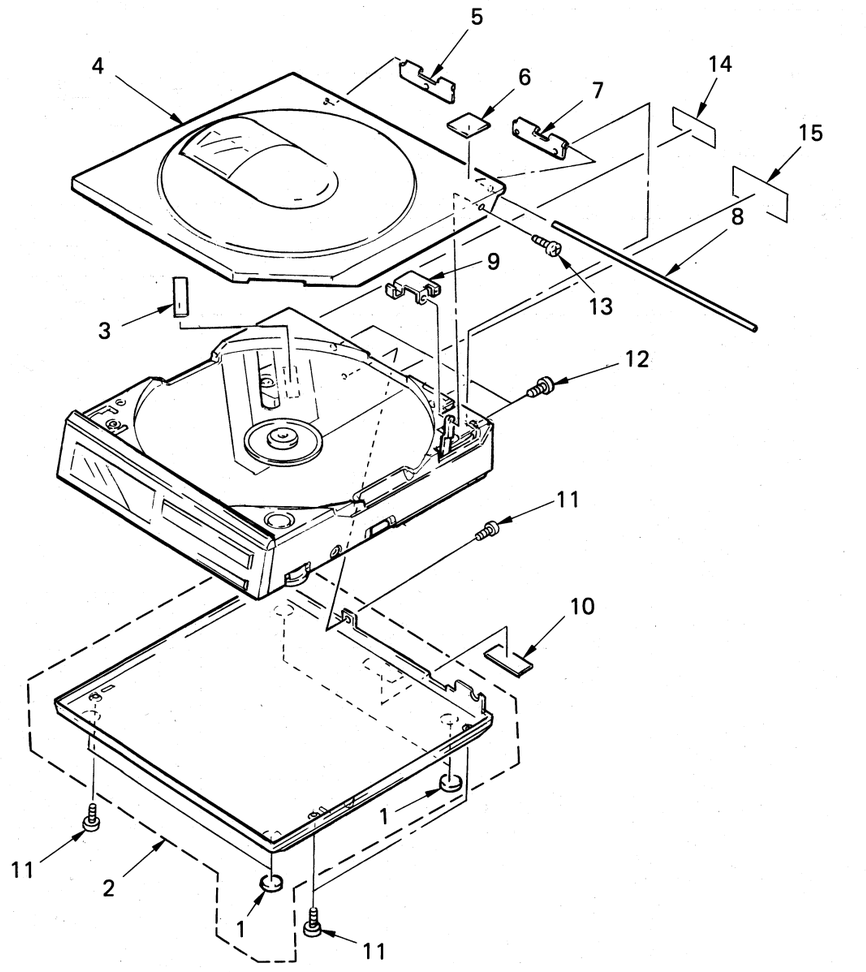
**Note: Les composants identifiés par un tramé et une marque ⚠ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.**



# SECTION 5
# EXPLODED VIEWS AND PARTS LIST

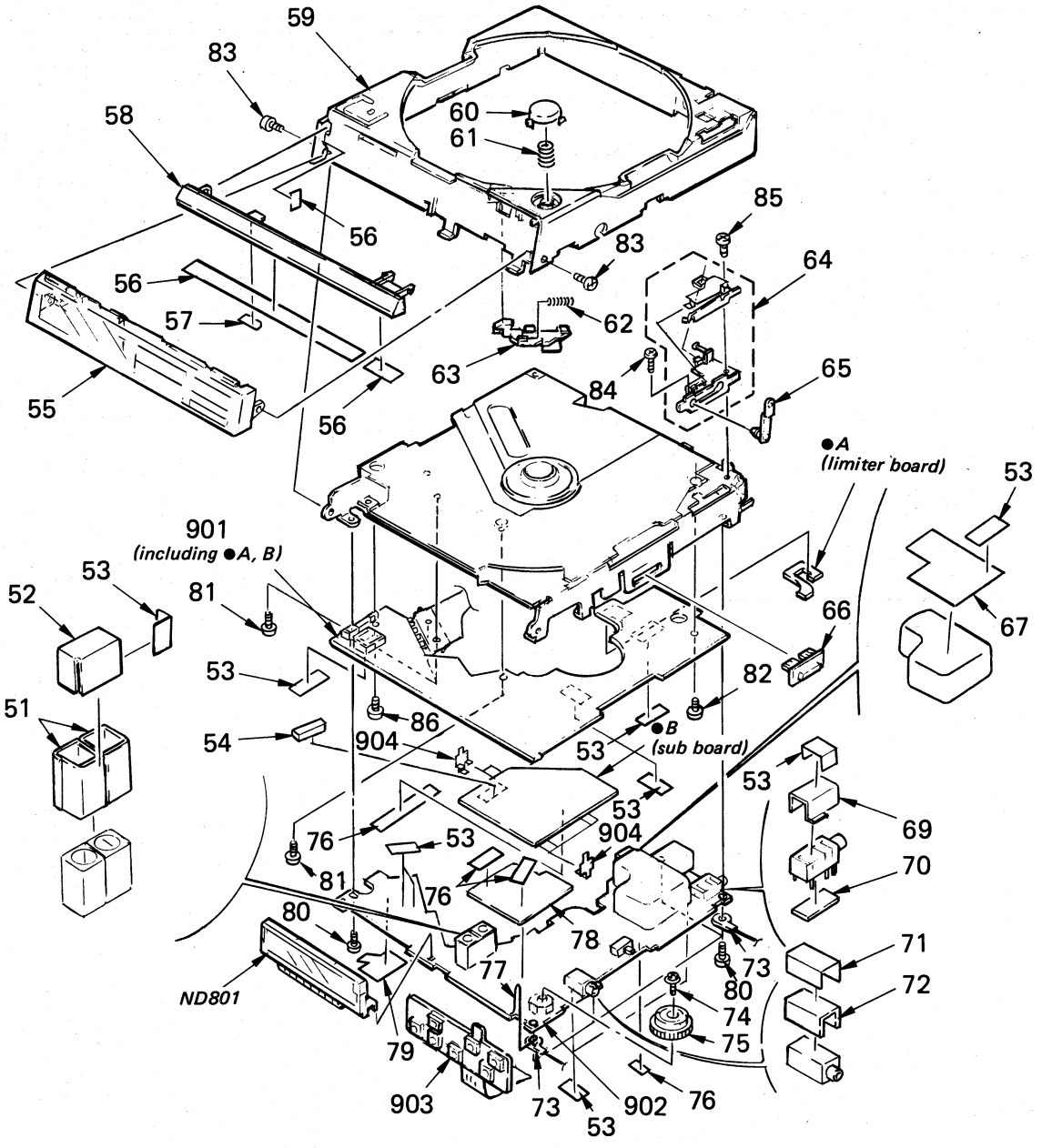
NOTE:
- The mechanical parts with no reference number in the exploded views are not supplied.
- Items marked " ★ " are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- The construction parts of an assembled part are indicated with a collation number in the remark column.

| | |
|---|---|
| The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified. | Les composants identifiés par une trame et une marque ⚠ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié. |




| No. | Part No. | Description | Remarks |
|---|---|---|---|
| 1 | 4-912-641-01 | FOOT, RUBBER | |
| 2 | X-4907-027-1 | PANEL ASSY, BOTTOM | |
| 3 | 4-908-711-01 | LABEL, CAUTION, LENS | |
| 4 | X-4907-028-1 | PANEL ASSY, TOP(SERIAL No.10001-25000) | |
| | X-4907-028-2 | PANEL ASSY, TOP(SERIAL No.25001 AND LATER) | |
| 5 | 4-912-643-01 | HINGE | |
| 6 | 3-703-709-00 | STICKER, SONY SYMBOL (15) | |
| 7 | 4-907-030-11 | PLATE, FULCRUM | |
| 8 | 4-907-031-01 | BAR, FULCRUM | |
| 9 | X-4907-023-1 | RETAINER ASSY, SPRING | |
| 10 | *4-885-838-01 | (AEP,UK,DUTCH)...LABEL, CLASS 1 | |
| 11 | 3-703-816-62 | SCREW (M1.4X2.2), SPECIAL HEAD | |
| 12 | 3-703-816-42 | SCREW (M1.4X2.5), SPECIAL HEAD | |
| 13 | 3-703-816-02 | SCREW (M1.4X2.0), SPECIAL HEAD | |
| 14 | 3-527-213-00 | (Canadian,AEP,UK,E,AUS,DUTCH) ...LABEL, SERIAL NUMBER | |
| | *3-701-999-00 | (US).....LABEL, SERIAL NUMBER | |
| 15 | 4-913-805-01 | (AEP,UK,E,AUS)...LABEL, MODEL NUMBER | |
| | 4-913-871-01 | (DUTCH) .....LABEL, MODEL NUMBER | |

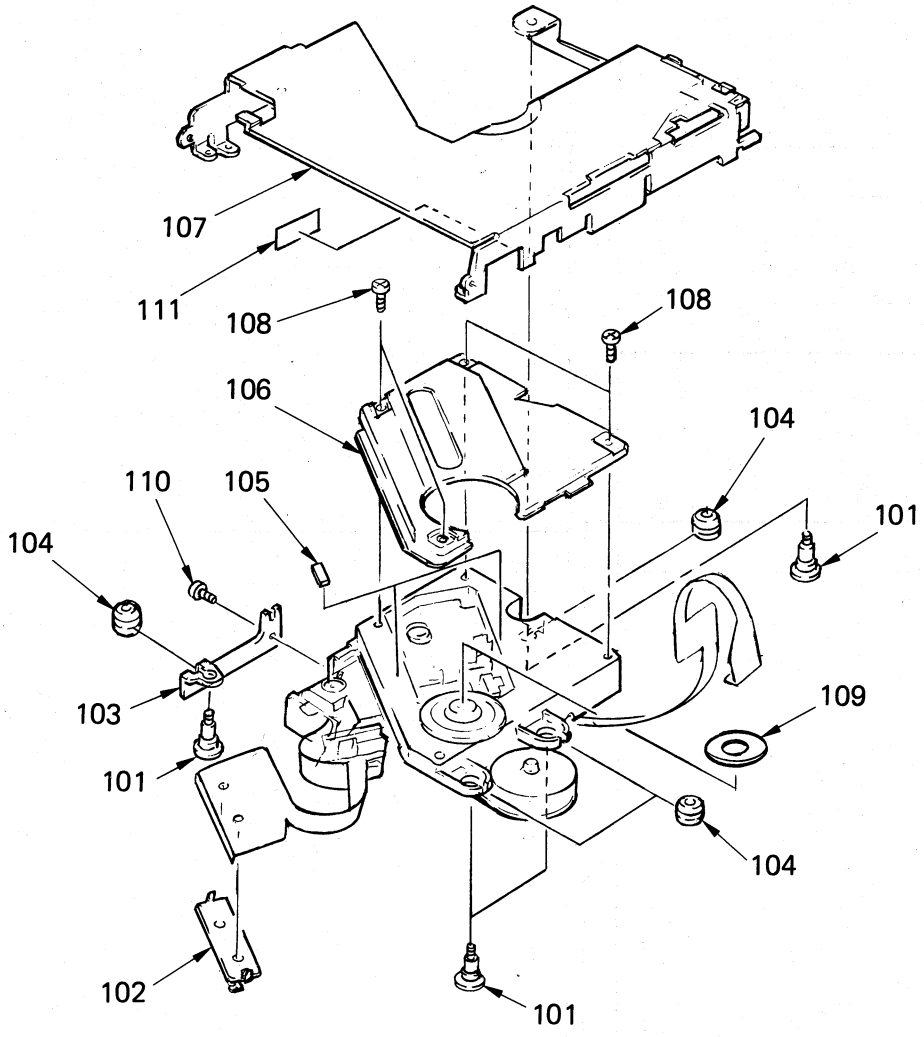
(2)




| No. | Part No. | Description | Remarks |
|---|---|---|---|
| 51 | *4-912-673-01 | PLATE, SHIELD | |
| 52 | *4-912-679-01 | SHEET, INSULATING, L.P.F | |
| 53 | 3-831-441-11 | CUSHION (B) | |
| 54 | 9-911-845-XX | SPACER (B) | |
| 55 | X-4907-020-1 | PANEL ASSY, FRONT | |
| 56 | *4-912-684-01 | SHEET (1), INSULATING | |
| 57 | *4-912-686-01 | SHEET (3), INSULATING | |
| 58 | 4-912-625-01 | STRIP, ORNAMENTAL | |
| 59 | 4-912-634-11 | CABINET | |
| 60 | 4-912-626-01 | BUTTON, OPEN | |
| 61 | 4-912-611-01 | SPRING, COMPRESSION | |
| 62 | 4-912-610-01 | SPRING, COMPRESSION | |
| 63 | 4-912-628-01 | PLATE, LOCK, SLIDE | |
| 64 | X-4907-025-1 | BRACKET ASSY, SWITCHING | |
| 65 | X-4907-024-1 | PLATE ASSY, SWITCHING | |
| 66 | 4-912-623-01 | KNOB, POWER | |
| 67 | *4-912-671-01 | SHEET (UPPER), DD CAPACITOR | |
| 69 | *4-912-690-02 | HOLDER, L.O JACK | |
| 70 | 4-912-637-01 | SPACER, JACK | |
| 71 | *4-912-688-01 | SHEET, PROTECTION, H.P | |

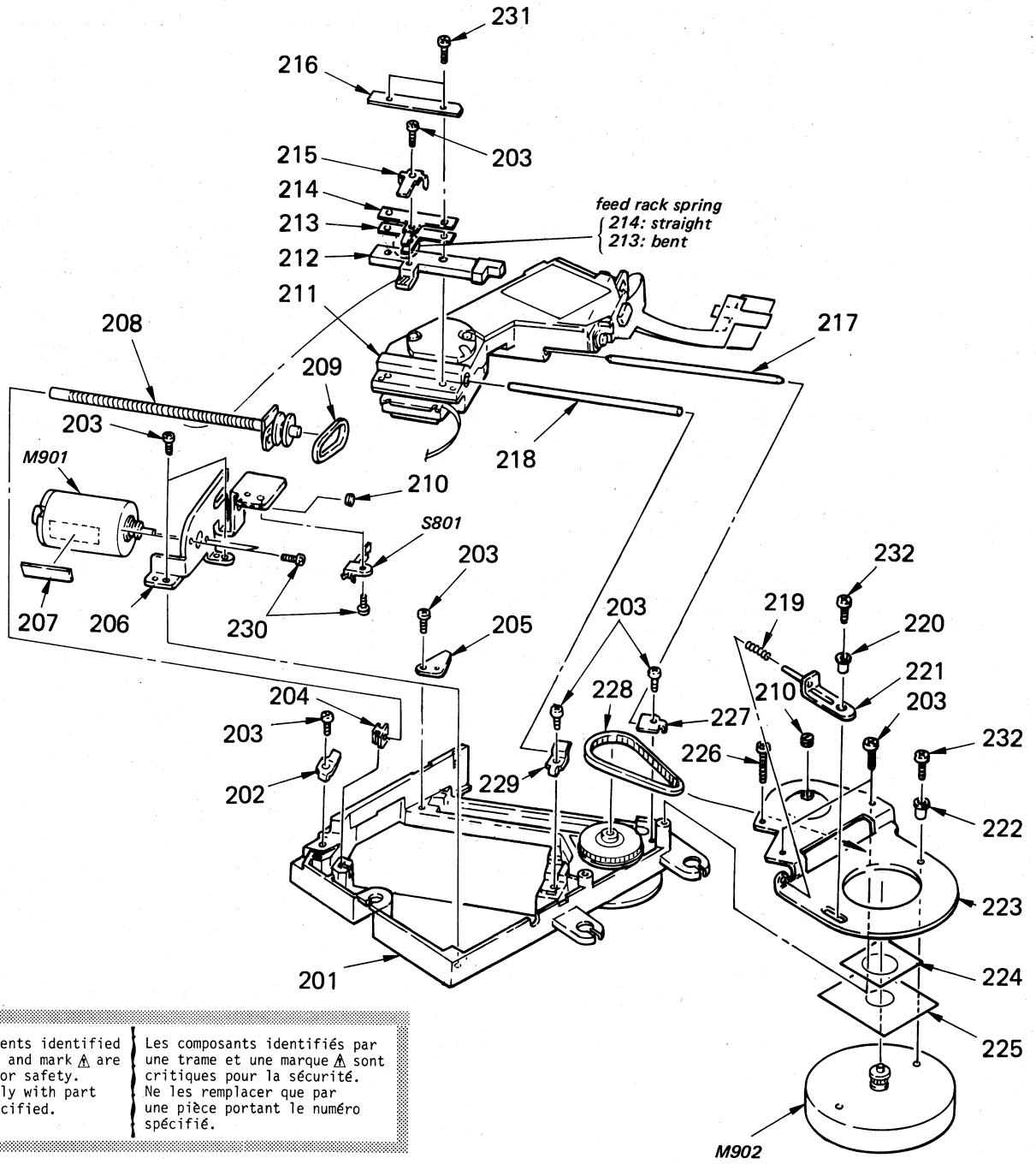
| No. | Part No. | Description | Remarks |
|---|---|---|---|
| 72 | *4-912-689-01 | HOLDER, H.P JACK | |
| 73 | *3-570-953-00 | STOPPER,MOTOR | |
| 74 | 3-703-502-31 | SCREW | |
| 75 | 4-912-638-01 | KNOB, VOLUME | |
| 76 | 3-831-441-XX | CUSHION (E) | |
| 77 | 4-912-680-02 | SPRING | |
| 78 | *4-912-675-01 | PAPER (A), SHIELD | |
| 79 | 3-331-021-01 | SHEET (C), INSULATING | |
| 80 | 3-703-816-42 | SCREW (M1.4X2.5), SPECIAL HEAD | |
| 81 | 3-703-816-01 | SCREW (M1.4X2.0), SPECIAL HEAD | |
| 82 | 7-685-103-14 | SCREW +P 2X5 TYPE2 NON-SLIT | |
| 83 | 3-703-816-72 | SCREW (M1.4X3.0), SPECIAL HEAD | |
| 84 | 3-703-816-32 | SCREW (M1.4X1.6), SPECIAL HEAD | |
| 85 | 3-703-816-02 | SCREW (M1.4X2.0), SPECIAL HEAD | |
| 86 | 4-912-652-01 | SCREW (2X5), TAPPING | |
| 901 | A-3015-398-A | PC BOARD ASSY, SERVO | |
| 902 | A-3015-397-A | (US,Canadian,AEP,E,AUS) ...PC BOARD ASSY, MAIN | |
| | A-3015-410-A | (UK).....PC BOARD ASSY, MAIN | |
| 903 | *1-617-507-11 | PC BOARD, SW | |
| ND801 | 1-807-331-11 | MODULE, LCD | |

(3)




| No. | Part No. | Description | Remarks |
|---|---|---|---|
| 101 | 4-908-754-11 | SCREW | |
| 102 | *4-912-608-01 | RETAINER, FLEXIBLE | |
| 103 | 4-907-039-01 | HOLDER (A), INSULATOR | |
| 104 | 4-908-755-01 | INSULATOR (2001) | |
| 105 | 9-911-837-XX | SPACER | |
| 106 | 4-912-651-01 | COVER, MD | |
| 107 | X-4907-026-1 | CHASSIS ASSY | |
| 108 | 3-893-942-11 | SCREW (1.7X3), TAPPING (B) | |
| 109 | 4-912-674-01 | ORNAMENT, TURNTABLE | |
| 110 | 7-627-553-38 | SCREW, PRECISION +P 2X3 | |
| 111 | 3-331-021-01 | SHEET, INSULATING | |

(4)




| The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified. | Les composants identifiés par une trame et une marque ⚠ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié. |
|---|---|

| No. | Part No. | Description | Remarks |
|---|---|---|---|
| 201 | X-4912-408-1 | CHASSIS ASSY, MD | |
| 202 | 3-320-134-01 | RETAINER (B1) | |
| 203 | 3-316-938-81 | SCREW (B1.4X5) (G), TAPPING | |
| 204 | 4-912-409-01 | RETAINER, FEED THRUST | |
| 205 | 3-320-104-01 | RETAINER (C) | |
| 206 | *4-912-410-01 | DISK, FEED | |
| 207 | 3-831-441-11 | CUSHION (B) | |
| 208 | X-4912-403-1 | SCREW ASSY, FEED | |
| 209 | 4-912-429-01 | BELT | |
| 210 | 2-622-801-01 | RETAINER, THRUST | |
| 211 ⚠ | X-4912-409-1 | PICK-UP ASSY (KSS-110G) | |
| 212 | 4-912-412-01 | RACK, FEED | |
| 213 | 4-912-423-11 | SPRING | |
| 214 | 4-912-423-01 | SPRING | |
| 215 | 4-912-416-01 | RETAINER, SCREW | |
| 216 | 3-320-133-01 | SPACER, RACK | |
| 217 | 3-320-136-01 | SHAFT (A1) | |
| 218 | 3-320-107-01 | SHAFT (B) | |

| No. | Part No. | Description | Remarks |
|---|---|---|---|
| 219 | 4-912-424-01 | SPRING, COMPRESSION | |
| 220 | 4-912-422-01 | COLLAR (B) | |
| 221 | X-4912-406-1 | PLATE ASSY, ADJUSTMENT, MOTOR | |
| 222 | 4-912-421-01 | COLLAR (A) | |
| 223 | *4-912-408-01 | BRACKET, MOTOR | |
| 224 | *4-912-428-01 | SHEET, ADHESIVE, SHEET | |
| 225 | *4-912-427-02 | SHEET, MOTOR | |
| 226 | 3-320-138-51 | SCREW (B1.4X12), TAPPING | |
| 227 | 3-320-105-01 | RETAINER (D) | |
| 228 | 4-912-401-01 | BELT, TOOTH | |
| 229 | 3-320-135-01 | RETAINER (A1) | |
| 230 | 7-627-553-27 | SCREW, PRECISION +P 2X2.5 | |
| 231 | 7-627-557-07 | SCREW, PRECISION +P 1.7X5.5 | |
| 232 | 7-627-552-48 | SCREW, PRECISION +P 1.7X4 | |
| 904 | *1-535-511-11 | FRAME, LEAD (F TYPE) | |
| M901 | 1-541-318-11 | MOTOR | |
| M902 | X-4912-407-1 | MOTOR ASSY, CLV | |
| S801 | 1-553-198-00 | SWITCH, LEAF | |

# SECTION 6
# ELECTRICAL PARTS LIST

NOTE:
- Items marked " * " are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- If there are two or more same circuitsin a set such as a stereophonic machine, only typical circuit parts may be indicated and capacitors and resistors in other same circuits may be omitted.

CAPACITORS:
MF:μF, PF:μμF.

RESISTORS
- All resistors are in ohms.
- F : nonflammable

COILS
- MMH : mH, UH : μH

SEMICONDUCTORS
In each case, U : μ, for example:
- UA...: μA..., UPA...: μPA..., UPC...: μPC, UPD...: μPD...

ELECTRICAL PARTS

| Ref.No. | Part No. | Description | | | |
|---|---|---|---|---|---|
| 901 | A-3015-398-A | PC BOARD ASSY, SERVO | | | |
| 902 | A-3015-397-A | (US,Canadian,AEP,E,AUS) ...PC BOARD ASSY, MAIN | | | |
| | A-3015-410-A | (UK).....PC BOARD ASSY, MAIN | | | |
| 903 | *1-617-507-11 | PC BOARD, SW | | | |
| 904 | *1-535-511-11 | FRAME, LEAD (F TYPE) | | | |
| C1 | 1-124-229-00 | ELECT | 33MF | 20% | 6.3V |
| C2 | 1-163-117-00 | CERAMIC CHIP | 100PF | 5% | 50V |
| C3 | 1-163-117-00 | CERAMIC CHIP | 100PF | 5% | 50V |
| C4 | 1-163-085-00 | CERAMIC CHIP | 2PF | 0.25PF | 50V |
| C5 | 1-163-038-00 | CERAMIC CHIP | 0.1MF | | 25V |
| C6 | 1-123-661-00 | ELECT | 100MF | 20% | 6.3V |
| C7 | 1-124-229-00 | ELECT | 33MF | 20% | 6.3V |
| C8 | 1-163-257-00 | CERAMIC CHIP | 180PF | 5% | 50V |
| C9 | 1-163-257-00 | CERAMIC CHIP | 180PF | 5% | 50V |
| C10 | 1-163-074-00 | CERAMIC CHIP | 0.033MF | 10% | 25V |
| C11 | 1-135-100-21 | TANTAL. CHIP | 6.8MF | 20% | 6.3V |
| C12 | 1-124-229-00 | ELECT | 33MF | 20% | 6.3V |
| C14 | 1-163-038-00 | CERAMIC CHIP | 0.1MF | | 25V |
| C15 | 1-163-038-00 | CERAMIC CHIP | 0.1MF | | 25V |
| C16 | 1-163-038-00 | CERAMIC CHIP | 0.1MF | | 25V |
| C17 | 1-163-141-00 | CERAMIC CHIP | 0.001MF | 10% | 50V |
| C18 | 1-163-109-00 | CERAMIC CHIP | 47PF | 5% | 50V |
| C19 | 1-163-038-00 | CERAMIC CHIP | 0.1MF | | 25V |
| C20 | 1-163-021-00 | CERAMIC CHIP | 0.01MF | 10% | 50V |
| C21 | 1-163-038-00 | CERAMIC CHIP | 0.1MF | | 25V |
| C22 | 1-163-117-00 | CERAMIC CHIP | 100PF | 5% | 50V |
| C23 | 1-135-101-21 | TANTAL. CHIP | 22MF | 10% | 6.3V |
| C101 | 1-163-188-00 | CERAMIC CHIP | 200PF | 5% | 50V |
| C103 | 1-163-335-11 | CERAMIC CHIP | 0.001MF | 5% | 50V |
| C104 | 1-163-335-11 | CERAMIC CHIP | 0.001MF | 5% | 50V |
| C105 | 1-163-108-00 | CERAMIC CHIP | 43PF | 5% | 50V |
| C106 | 1-163-211-00 | CERAMIC CHIP | 0.0018MF | 5% | 50V |
| C107 | 1-163-335-11 | CERAMIC CHIP | 0.001MF | 5% | 50V |
| C108 | 1-163-108-00 | CERAMIC CHIP | 43PF | 5% | 50V |
| C109 | 1-130-479-00 | MYLAR | 0.0047MF | 5% | 50V |
| C110 | 1-130-480-00 | MYLAR | 0.0056MF | 5% | 50V |
| C111 | 1-130-477-00 | MYLAR | 0.0033MF | 5% | 50V |
| C112 | 1-135-096-21 | TANTAL. CHIP | 4.7MF | 20% | 10V |
| C113 | 1-135-096-21 | TANTAL. CHIP | 4.7MF | 20% | 10V |
| C114 | 1-135-096-21 | TANTAL. CHIP | 4.7MF | 20% | 10V |
| C115 | 1-135-096-21 | TANTAL. CHIP | 4.7MF | 20% | 10V |
| C116 | 1-124-443-00 | ELECT | 100MF | 20% | 10V |
| C117 | 1-135-100-21 | TANTAL. CHIP | 6.8MF | 20% | 6.3V |
| C201 | 1-163-188-00 | CERAMIC CHIP | 200PF | 5% | 50V |

ELECTRICAL PARTS

| Ref.No. | Part No. | Description | | | |
|---|---|---|---|---|---|
| C203 | 1-163-335-11 | CERAMIC CHIP | 0.001MF | 5% | 50V |
| C204 | 1-163-335-11 | CERAMIC CHIP | 0.001MF | 5% | 50V |
| C205 | 1-163-108-00 | CERAMIC CHIP | 43PF | 5% | 50V |
| C206 | 1-163-211-00 | CERAMIC CHIP | 0.0018MF | 5% | 50V |
| C207 | 1-163-335-11 | CERAMIC CHIP | 0.001MF | 5% | 50V |
| C208 | 1-163-108-00 | CERAMIC CHIP | 43PF | 5% | 50V |
| C209 | 1-130-479-00 | MYLAR | 0.0047MF | 5% | 50V |
| C210 | 1-130-480-00 | MYLAR | 0.0056MF | 5% | 50V |
| C211 | 1-130-477-00 | MYLAR | 0.0033MF | 5% | 50V |
| C212 | 1-135-096-21 | TANTAL. CHIP | 4.7MF | 20% | 10V |
| C213 | 1-135-096-21 | TANTAL. CHIP | 4.7MF | 20% | 10V |
| C214 | 1-135-096-21 | TANTAL. CHIP | 4.7MF | 20% | 10V |
| C215 | 1-135-096-21 | TANTAL. CHIP | 4.7MF | 20% | 10V |
| C216 | 1-124-443-00 | ELECT | 100MF | 20% | 10V |
| C217 | 1-135-100-21 | TANTAL. CHIP | 6.8MF | 20% | 6.3V |
| C301 | 1-135-099-00 | TANTAL. CHIP | 2.2MF | 20% | 6.3V |
| C302 | 1-135-092-21 | TANTAL. CHIP | 3.3MF | 20% | 16V |
| C303 | 1-135-096-21 | TANTAL. CHIP | 4.7MF | 20% | 10V |
| C306 | 1-135-096-21 | TANTAL. CHIP | 4.7MF | 20% | 10V |
| C307 | 1-135-096-21 | TANTAL. CHIP | 4.7MF | 20% | 10V |
| C308 | 1-135-092-21 | TANTAL. CHIP | 3.3MF | 20% | 16V |
| C309 | 1-135-091-00 | (MAIN BOARD)...TANTAL. CHIP | 1MF | 20% | 16V |
| C309 | 1-135-100-21 | (SUB BOARD)....TANTAL. CHIP | 6.8MF | 20% | 6.3V |
| C310 | 1-135-100-21 | (SUB BOARD)....TANTAL. CHIP | 6.8MF | 20% | 6.3V |
| C310 | 1-163-038-00 | (MAIN BOARD)...CERAMIC CHIP | 0.1MF | | 25V |
| C401 | 1-163-017-00 | CERAMIC CHIP | 0.0047MF | 10% | 50V |
| C402 | 1-124-144-00 | ELECT | 220MF | 20% | 16V |
| C403 | 1-124-445-00 | ELECT | 100MF | 20% | 16V |
| C404 | 1-124-470-11 | ELECT | 470MF | 20% | 6.3V |
| C405 | 1-124-470-11 | ELECT | 470MF | 20% | 6.3V |
| C406 | 1-124-242-00 | ELECT | 33MF | 20% | 16V |
| C407 | 1-124-242-00 | ELECT | 33MF | 20% | 16V |
| C408 | 1-124-224-00 | ELECT | 47MF | 20% | 6.3V |
| C409 | 1-124-224-00 | ELECT | 47MF | 20% | 6.3V |
| C410 | 1-163-117-00 | CERAMIC CHIP | 100PF | 5% | 50V |
| C411 | 1-124-257-00 | ELECT | 2.2MF | 20% | 50V |
| C412 | 1-124-234-00 | ELECT | 22MF | 20% | 16V |
| C413 | 1-124-257-00 | ELECT | 2.2MF | 20% | 50V |
| C414 | 1-124-257-00 | ELECT | 2.2MF | 20% | 50V |
| C415 | 1-135-092-21 | TANTAL. CHIP | 3.3MF | 20% | 16V |
| C416 | 1-131-368-00 | (UK)....TANTAL | 3.3MF | 20% | 16V |
| C417 | 1-124-234-00 | (UK)....ELECT | 22MF | 20% | 16V |
| C501 | 1-135-100-21 | TANTAL. CHIP | 6.8MF | 20% | 6.3V |

ELECTRICAL PARTS

| Ref.No. | Part No. | Description | | |
|---|---|---|---|---|
| C502 | 1-135-101-21 | TANTAL. CHIP 22MF | 10% | 6.3V |
| C503 | 1-135-100-21 | TANTAL. CHIP 6.8MF | 20% | 6.3V |
| C504 | 1-163-081-00 | CERAMIC CHIP 0.22MF | | 25V |
| C505 | 1-163-037-00 | CERAMIC CHIP 0.022MF | 10% | 25V |
| C506 | 1-163-075-00 | CERAMIC CHIP 0.047MF | 10% | 25V |
| C507 | 1-163-021-00 | CERAMIC CHIP 0.01MF | 10% | 50V |
| C508 | 1-163-114-00 | CERAMIC CHIP 75PF | 5% | 50V |
| C509 | 1-163-109-00 | CERAMIC CHIP 47PF | 5% | 50V |
| C510 | 1-163-081-00 | CERAMIC CHIP 0.22MF | | 25V |
| C511 | 1-135-104-00 | TANTAL. CHIP 10MF | 20% | 4V |
| C512 | 1-163-124-00 | CERAMIC CHIP 200PF | 5% | 50V |
| C513 | 1-163-019-00 | CERAMIC CHIP 0.0068MF | 10% | 50V |
| C514 | 1-163-021-00 | CERAMIC CHIP 0.01MF | 10% | 50V |
| C515 | 1-163-019-00 | CERAMIC CHIP 0.0068MF | 10% | 50V |
| C516 | 1-163-013-00 | CERAMIC CHIP 0.0022MF | 10% | 50V |
| C517 | 1-135-083-00 | TANTAL. CHIP 0.47MF | 10% | 25V |
| C519 | 1-163-021-00 | CERAMIC CHIP 0.01MF | 10% | 50V |
| C520 | 1-163-023-00 | CERAMIC CHIP 0.015MF | 10% | 50V |
| C521 | 1-124-778-00 | ELECT 22MF | 20% | 6.3V |
| C522 | 1-135-100-21 | TANTAL. CHIP 6.8MF | 20% | 6.3V |
| C523 | 1-163-017-00 | CERAMIC CHIP 0.0047MF | 10% | 50V |
| C524 | 1-124-779-00 | ELECT 10MF | 20% | 16V |
| C525 | 1-163-081-00 | CERAMIC CHIP 0.22MF | | 25V |
| C526 | 1-163-015-00 | CERAMIC CHIP 0.0033MF | 10% | 50V |
| C527 | 1-163-015-00 | CERAMIC CHIP 0.0033MF | 10% | 50V |
| C529 | 1-163-017-00 | CERAMIC CHIP 0.0047MF | 10% | 50V |
| C530 | 1-124-779-00 | ELECT 10MF | 20% | 16V |
| C531 | 1-163-081-00 | CERAMIC CHIP 0.22MF | | 25V |
| C532 | 1-163-021-00 | CERAMIC CHIP 0.01MF | 10% | 50V |
| C533 | 1-163-021-00 | CERAMIC CHIP 0.01MF | 10% | 50V |
| C534 | 1-163-021-00 | CERAMIC CHIP 0.01MF | 10% | 50V |
| C535 | 1-163-021-00 | CERAMIC CHIP 0.01MF | 10% | 50V |
| C537 | 1-163-081-00 | CERAMIC CHIP 0.22MF | | 25V |
| C538 | 1-124-778-00 | ELECT 22MF | 20% | 6.3V |
| C539 | 1-135-083-00 | TANTAL. CHIP 0.47MF | 10% | 25V |
| C540 | 1-163-038-00 | CERAMIC CHIP 0.1MF | | 25V |
| C541 | 1-161-013-00 | CERAMIC 0.01MF | 10% | 25V |
| C542 | 1-163-037-00 | CERAMIC CHIP 0.022MF | 10% | 25V |
| C543 | 1-131-375-00 | TANTALUM 4.7MF | 10% | 6.3V |
| C601 | 1-163-038-00 | CERAMIC CHIP 0.1MF | | 25V |
| C602 | 1-163-101-00 | CERAMIC CHIP 22PF | 5% | 50V |
| C603 | 1-163-101-00 | CERAMIC CHIP 22PF | 5% | 50V |
| C604 | 1-163-038-00 | CERAMIC CHIP 0.1MF | | 25V |
| C605 | 1-135-091-00 | TANTAL. CHIP 1MF | 20% | 16V |
| C606 | 1-163-113-00 | CERAMIC CHIP 68PF | 5% | 50V |
| C607 | 1-135-100-21 | TANTAL. CHIP 6.8MF | 20% | 6.3V |
| C608 | 1-163-037-00 | CERAMIC CHIP 0.022MF | 10% | 25V |
| C609 | 1-163-105-00 | CERAMIC CHIP 33PF | 5% | 50V |
| C610 | 1-163-105-00 | CERAMIC CHIP 33PF | 5% | 50V |
| C611 | 1-163-123-00 | CERAMIC CHIP 180PF | 5% | 50V |
| C612 | 1-163-074-00 | CERAMIC CHIP 0.033MF | 10% | 25V |
| C613 | 1-163-074-00 | CERAMIC CHIP 0.033MF | 10% | 25V |
| C614 | 1-131-420-00 | TANTALUM 4.7MF | 20% | 10V |
| C615 | 1-124-229-00 | ELECT 33MF | 20% | 6.3V |
| C616 | 1-124-229-00 | ELECT 33MF | 20% | 6.3V |
| C617 | 1-131-420-00 | TANTALUM 4.7MF | 20% | 10V |
| C618 | 1-163-209-00 | CERAMIC CHIP 0.0015MF | 10% | 50V |

ELECTRICAL PARTS

| Ref.No. | Part No. | Description | | |
|---|---|---|---|---|
| C619 | 1-163-021-00 | (SERVO BOARD)...CERAMIC CHIP 0.01MF | 5% | 50V |
| C619 | 1-163-117-00 | (SUB BOARD).....CERAMIC CHIP 100PF | 5% | 50V |
| C620 | 1-163-021-00 | CERAMIC CHIP 0.01MF | 5% | 50V |
| C621 | 1-163-060-00 | CERAMIC CHIP 0.012MF | 10% | 50V |
| C622 | 1-163-060-00 | CERAMIC CHIP 0.012MF | 10% | 50V |
| C623 | 1-163-021-00 | CERAMIC CHIP 0.01MF | 5% | 50V |
| C801 | 1-163-105-00 | CERAMIC CHIP 33PF | 5% | 50V |
| C802 | 1-163-077-00 | CERAMIC CHIP 0.1MF | | 50V |
| C803 | 1-135-099-00 | TANTAL. CHIP 2.2MF | 20% | 6.3V |
| C804 | 1-163-205-00 | CERAMIC CHIP 0.001MF | 5% | 50V |
| CN401 | 1-507-749-00 | JACK, EXTENTION POWER (DC IN 9V) | | |
| CNJ401 | 1-535-608-11 | TERMINAL, BATTERY | | |
| CP401 | 1-464-572-11 | CONVERTER UNIT, DC-DC | | |
| D1 | 8-719-101-23 | DIODE 1SS123 | | |
| D402 | 8-719-100-03 | DIODE 1S2835 | | |
| D403 | 8-719-200-35 | DIODE E10QS03 | | |
| D405 | 8-719-100-03 | DIODE 1S2835 | | |
| D406 | 8-719-101-58 | (UK)...DIODE RD5.6E-L2 | | |
| D501 | 8-719-101-23 | DIODE 1SS123 | | |
| D502 | 8-719-911-06 | DIODE 1SS106 | | |
| D503 | 8-719-200-35 | DIODE E10QS03 | | |
| D504 | 8-719-200-35 | DIODE E10QS03 | | |
| D505 | 8-719-200-35 | DIODE E10QS03 | | |
| D506 | 8-719-200-35 | DIODE E10QS03 | | |
| D507 | 8-719-200-35 | DIODE E10QS03 | | |
| D508 | 8-719-200-35 | DIODE E10QS03 | | |
| D601 | 8-719-927-77 | DIODE KV1230Z | | |
| D801 | 8-719-100-03 | DIODE 1S2835 | | |
| D802 | 8-719-100-05 | DIODE 1S2837 | | |
| D803 | 8-719-911-19 | DIODE 1SS119 | | |
| FL101 | 1-235-403-11 | FILTER, LOW PASS | | |
| FL201 | 1-235-403-11 | FILTER, LOW PASS | | |
| IC1 | 8-752-010-90 | IC CX20109 | | |
| IC2 | 8-759-700-43 | IC NJM4558M | | |
| IC101 | 8-759-603-27 | IC M5201FP | | |
| IC102 | 8-759-745-64 | IC NJM4560M | | |
| IC201 | 8-759-603-27 | IC M5201FP | | |
| IC202 | 8-759-745-64 | IC NJM4560M | | |
| IC301 | 8-759-924-49 | IC PCM55HP-S | | |
| IC302 | 8-759-103-25 | IC UPD4053BG | | |
| IC303 | 8-759-908-16 | IC TL072CPS | | |
| IC304 | 8-759-745-56 | IC NJM4556D | | |
| IC401 | 8-759-914-44 | IC TL431CLPB | | |
| IC501 | 8-752-030-56 | IC CXA1023M | | |
| IC502 | 8-759-924-58 | IC CXA1083M | | |
| IC503 | 8-759-924-58 | IC CXA1083M | | |
| IC504 | 8-759-700-43 | IC NJM4558M | | |
| IC601 | 8-759-912-52 | IC CX23035 | | |
| IC602 | 8-759-302-72 | IC HM6116FP-3 | | |
| IC603 | 8-759-908-17 | IC TL082CPS | | |
| IC801 | 8-752-800-29 | IC CXP5024H-001Q | | |
| IC802 | 8-759-912-55 | IC S-81250HG | | |
| IC803 | 8-759-700-07 | IC NJM2903M | | |

ELECTRICAL PARTS

| Ref.No. | Part No. | Description | | | |
|---|---|---|---|---|---|
| J301 | 1-507-950-21 | JACK (LINE IN) | | | |
| J302 | 1-507-950-11 | JACK (PHONES) | | | |
| JR401 | 1-216-296-00 | METAL CHIP | 0 | 5% | 1/8W |
| JR501 | 1-216-295-00 | METAL CHIP | 0 | 5% | 1/10W |
| JR502 | 1-216-295-00 | METAL CHIP | 0 | 5% | 1/10W |
| JR503 | 1-216-295-00 | METAL CHIP | 0 | 5% | 1/10W |
| JR504 | 1-216-296-00 | METAL CHIP | 0 | 5% | 1/8W |
| JR601 | 1-216-295-00 | METAL CHIP | 0 | 5% | 1/10W |
| L401 | 1-410-526-11 | MICRO INDUCTOR 10UH | | | |
| L402 | 1-410-526-11 | MICRO INDUCTOR 10UH | | | |
| L501 | 1-410-526-11 | MICRO INDUCTOR 10UH | | | |
| L502 | 1-410-527-11 | MICRO INDUCTOR 100UH | | | |
| L503 | 1-410-393-11 | INDUCTOR CHIP 100UH | | | |
| L504 | 1-459-639-11 | COIL (WITH CORE) | | | |
| L601 | 1-405-982-00 | COIL, OSC (SW1) | | | |
| L602 | 1-410-328-11 | MICRO INDUCTOR 10UH | | | |
| M901 | 1-541-318-11 | MOTOR | | | |
| M902 | X-4912-407-1 | MOTOR ASSY, CLV | | | |
| ND801 | 1-807-331-11 | MODULE, LCD | | | |
| PS401 | 1-532-605-00 | (UK)....LINC, IC | | | |
| Q1 | 8-729-101-07 | TRANSISTOR 2SB798 | | | |
| Q2 | 8-729-162-44 | TRANSISTOR 2SB624-BV4 | | | |
| Q3 | 8-729-159-64 | TRANSISTOR 2SD596 | | | |
| Q4 | 8-729-159-64 | TRANSISTOR 2SD596 | | | |
| Q5 | 8-729-159-64 | TRANSISTOR 2SD596 | | | |
| Q101 | 8-729-159-64 | TRANSISTOR 2SD596 | | | |
| Q102 | 8-729-159-64 | TRANSISTOR 2SD596 | | | |
| Q201 | 8-729-159-64 | TRANSISTOR 2SD596 | | | |
| Q202 | 8-729-159-64 | TRANSISTOR 2SD596 | | | |
| Q301 | 8-729-901-00 | TRANSISTOR DTC124EK | | | |
| Q302 | 8-729-901-00 | TRANSISTOR DTC124EK | | | |
| Q303 | 8-729-901-05 | TRANSISTOR DTA124EK | | | |
| Q304 | 8-729-159-64 | TRANSISTOR 2SD596 | | | |
| Q401 | 8-729-901-05 | TRANSISTOR DTA124EK | | | |
| Q402 | 8-729-903-10 | TRANSISTOR FMW1 | | | |
| Q403 | 8-729-101-07 | TRANSISTOR 2SB798 | | | |
| Q404 | 8-729-902-96 | TRANSISTOR FMS1 | | | |
| Q405 | 8-729-199-92 | TRANSISTOR 2SD999 | | | |
| Q406 | 8-729-162-44 | TRANSISTOR 2SB624-BV4 | | | |
| Q407 | 8-729-903-10 | TRANSISTOR FMW1 | | | |
| Q408 | 8-729-105-29 | TRANSISTOR 2SA1385 | | | |
| Q409 | 8-729-162-44 | TRANSISTOR 2SB624-BV4 | | | |
| Q410 | 8-729-901-05 | TRANSISTOR DTA124EK | | | |
| Q411 | 8-729-159-64 | TRANSISTOR 2SD596 | | | |
| Q501 | 8-729-902-93 | TRANSISTOR FMG4 | | | |
| Q502 | 8-729-901-05 | TRANSISTOR DTA124EK | | | |
| Q503 | 8-729-901-00 | TRANSISTOR DTC124EK | | | |
| Q504 | 8-729-159-64 | TRANSISTOR 2SD596 | | | |
| Q505 | 8-729-159-64 | TRANSISTOR 2SD596 | | | |
| Q506 | 8-729-162-44 | TRANSISTOR 2SB624-BV4 | | | |
| Q507 | 8-729-901-00 | TRANSISTOR DTC124EK | | | |
| Q601 | 8-729-159-64 | TRANSISTOR 2SD596 | | | |
| Q602 | 8-729-162-44 | TRANSISTOR 2SB624-BV4 | | | |
| Q603 | 8-729-159-64 | TRANSISTOR 2SD596 | | | |
| Q604 | 8-729-162-44 | TRANSISTOR 2SB624-BV4 | | | |
| Q605 | 8-729-903-10 | TRANSISTOR FMW1 | | | |

ELECTRICAL PARTS

| Ref.No. | Part No. | Description | | | |
|---|---|---|---|---|---|
| Q606 | 8-729-162-44 | TRANSISTOR 2SA624-BV4 | | | |
| Q801 | 8-729-901-05 | TRANSISTOR DTA124EK | | | |
| Q802 | 8-729-900-52 | TRANSISTOR DTC114YK | | | |
| R1 | 1-216-049-00 | METAL CHIP | 1K | 5% | 1/10W |
| R2 | 1-216-097-00 | METAL CHIP | 100K | 5% | 1/10W |
| R3 | 1-216-101-00 | METAL CHIP | 150K | 5% | 1/10W |
| R4 | 1-216-061-00 | METAL CHIP | 3.3K | 5% | 1/10W |
| R5 | 1-216-093-00 | METAL CHIP | 68K | 5% | 1/10W |
| R6 | 1-216-057-00 | METAL CHIP | 2.2K | 5% | 1/10W |
| R7 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R8 | 1-216-105-00 | METAL CHIP | 220K | 5% | 1/10W |
| R9 | 1-216-091-00 | METAL CHIP | 56K | 5% | 1/10W |
| R10 | 1-216-095-00 | METAL CHIP | 82K | 5% | 1/10W |
| R11 | 1-216-073-00 | METAL CHIP | 10K | 5% | 1/10W |
| R13 | 1-216-326-11 | METAL CHIP | 1.8K | 1% | 1/10W |
| R14 | 1-249-429-11 | CARBON | 10K | 5% | 1/6W |
| R15 | 1-216-027-00 | METAL CHIP | 120 | 5% | 1/10W |
| R17 | 1-216-073-00 | METAL CHIP | 10K | 5% | 1/10W |
| R18 | 1-216-091-00 | METAL CHIP | 56K | 5% | 1/10W |
| R19 | 1-216-049-00 | METAL CHIP | 1K | 5% | 1/10W |
| R20 | 1-216-063-00 | METAL CHIP | 3.9K | 5% | 1/10W |
| R21 | 1-216-043-00 | METAL CHIP | 560 | 5% | 1/10W |
| R22 | 1-216-057-00 | METAL CHIP | 2.2K | 5% | 1/10W |
| R23 | 1-216-129-00 | METAL CHIP | 2.2M | 5% | 1/10W |
| R24 | 1-216-164-00 | METAL CHIP | 39 | 5% | 1/8W |
| R25 | 1-216-164-00 | METAL CHIP | 39 | 5% | 1/8W |
| R26 | 1-216-113-00 | METAL CHIP | 470K | 5% | 1/10W |
| R27 | 1-216-073-00 | METAL CHIP | 10K | 5% | 1/10W |
| R28 | 1-216-049-00 | METAL CHIP | 1K | 5% | 1/10W |
| R30 | 1-216-061-00 | METAL CHIP | 3.3K | 5% | 1/10W |
| R31 | 1-216-105-00 | METAL CHIP | 220K | 5% | 1/10W |
| R32 | 1-216-121-00 | METAL CHIP | 1M | 5% | 1/10W |
| R33 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R35 | 1-216-071-00 | METAL CHIP | 8.2K | 5% | 1/10W |
| R101 | 1-216-334-11 | METAL CHIP | 22K | 1% | 1/10W |
| R102 | 1-216-333-11 | METAL CHIP | 15K | 1% | 1/10W |
| R103 | 1-216-329-11 | METAL CHIP | 5.1K | 1% | 1/10W |
| R104 | 1-216-336-11 | METAL CHIP | 47K | 1% | 1/10W |
| R105 | 1-216-336-11 | METAL CHIP | 47K | 1% | 1/10W |
| R106 | 1-216-334-11 | METAL CHIP | 22K | 1% | 1/10W |
| R107 | 1-216-329-11 | METAL CHIP | 5.1K | 1% | 1/10W |
| R108 | 1-216-336-11 | METAL CHIP | 47K | 1% | 1/10W |
| R109 | 1-216-336-11 | METAL CHIP | 47K | 1% | 1/10W |
| R110 | 1-216-334-11 | METAL CHIP | 22K | 1% | 1/10W |
| R111 | 1-216-518-00 | METAL CHIP | 2.2K | 1% | 1/10W |
| R112 | 1-216-518-00 | METAL CHIP | 2.2K | 1% | 1/10W |
| R113 | 1-216-326-11 | METAL CHIP | 1.8K | 1% | 1/10W |
| R114 | 1-216-333-11 | METAL CHIP | 15K | 1% | 1/10W |
| R115 | 1-216-328-11 | METAL CHIP | 4.3K | 1% | 1/10W |
| R116 | 1-216-333-11 | METAL CHIP | 15K | 1% | 1/10W |
| R117 | 1-216-328-11 | METAL CHIP | 4.3K | 1% | 1/10W |
| R118 | 1-216-037-00 | METAL CHIP | 330 | 5% | 1/10W |
| R119 | 1-216-033-00 | METAL CHIP | 220 | 5% | 1/10W |
| R120 | 1-216-073-00 | METAL CHIP | 10K | 5% | 1/10W |
| R122 | 1-216-089-00 | METAL CHIP | 47K | 5% | 1/10W |
| R124 | 1-216-067-00 | METAL CHIP | 5.6K | 5% | 1/10W |
| R125 | 1-216-087-00 | METAL CHIP | 39K | 5% | 1/10W |

ELECTRICAL PARTS

| Ref.No. | Part No. | Description | | | |
|---|---|---|---|---|---|
| R126 | 1-216-073-00 | METAL CHIP | 10K | 5% | 1/10W |
| R127 | 1-216-160-00 | METAL CHIP | 27 | 5% | 1/8W |
| R128 | 1-216-033-00 | METAL CHIP | 220 | 5% | 1/10W |
| R129 | 1-216-059-00 | METAL CHIP | 2.7K | 5% | 1/10W |
| R130 | 1-216-059-00 | METAL CHIP | 2.7K | 5% | 1/10W |
| R201 | 1-216-334-11 | METAL CHIP | 22K | 1% | 1/10W |
| R202 | 1-216-333-11 | METAL CHIP | 15K | 1% | 1/10W |
| R203 | 1-216-329-11 | METAL CHIP | 5.1K | 1% | 1/10W |
| R204 | 1-216-336-11 | METAL CHIP | 47K | 1% | 1/10W |
| R205 | 1-216-336-11 | METAL CHIP | 47K | 1% | 1/10W |
| R206 | 1-216-334-11 | METAL CHIP | 22K | 1% | 1/10W |
| R207 | 1-216-329-11 | METAL CHIP | 5.1K | 1% | 1/10W |
| R208 | 1-216-336-11 | METAL CHIP | 47K | 1% | 1/10W |
| R209 | 1-216-336-11 | METAL CHIP | 47K | 1% | 1/10W |
| R210 | 1-216-334-11 | METAL CHIP | 22K | 1% | 1/10W |
| R211 | 1-216-518-00 | METAL CHIP | 2.2K | 1% | 1/10W |
| R212 | 1-216-518-00 | METAL CHIP | 2.2K | 1% | 1/10W |
| R213 | 1-216-326-11 | METAL CHIP | 1.8K | 1% | 1/10W |
| R214 | 1-216-333-11 | METAL CHIP | 15K | 1% | 1/10W |
| R215 | 1-216-328-11 | METAL CHIP | 4.3K | 1% | 1/10W |
| R216 | 1-216-333-11 | METAL CHIP | 15K | 1% | 1/10W |
| R217 | 1-216-328-11 | METAL CHIP | 4.3K | 1% | 1/10W |
| R218 | 1-216-037-00 | METAL CHIP | 330 | 5% | 1/10W |
| R219 | 1-216-033-00 | METAL CHIP | 220 | 5% | 1/10W |
| R220 | 1-216-073-00 | METAL CHIP | 10K | 5% | 1/10W |
| R222 | 1-216-089-00 | METAL CHIP | 47K | 5% | 1/10W |
| R224 | 1-216-067-00 | METAL CHIP | 5.6K | 5% | 1/10W |
| R225 | 1-216-087-00 | METAL CHIP | 39K | 5% | 1/10W |
| R226 | 1-216-073-00 | METAL CHIP | 10K | 5% | 1/10W |
| R227 | 1-216-160-00 | METAL CHIP | 27 | 5% | 1/8W |
| R228 | 1-216-033-00 | METAL CHIP | 220 | 5% | 1/10W |
| R229 | 1-216-059-00 | METAL CHIP | 2.7K | 5% | 1/10W |
| R230 | 1-216-059-00 | METAL CHIP | 2.7K | 5% | 1/10W |
| R301 | 1-216-089-00 | METAL CHIP | 47K | 5% | 1/10W |
| R302 | 1-216-073-00 | METAL CHIP | 10K | 5% | 1/10W |
| R303 | 1-216-083-00 | METAL CHIP | 27K | 5% | 1/10W |
| R305 | 1-216-105-00 | METAL CHIP | 220K | 5% | 1/10W |
| R308 | 1-216-089-00 | METAL CHIP | 47K | 5% | 1/10W |
| R309 | 1-216-109-00 | METAL CHIP | 330K | 5% | 1/10W |
| R310 | 1-216-105-00 | METAL CHIP | 220K | 5% | 1/10W |
| R311 | 1-216-134-00 | METAL CHIP | 2.2 | 5% | 1/8W |
| R312 | 1-216-134-00 | METAL CHIP | 2.2 | 5% | 1/8W |
| R401 | 1-216-065-00 | METAL CHIP | 4.7K | 5% | 1/10W |
| R402 | 1-216-089-00 | METAL CHIP | 47K | 5% | 1/10W |
| R403 | 1-216-056-00 | METAL CHIP | 2K | 5% | 1/10W |
| R404 | 1-216-065-00 | METAL CHIP | 4.7K | 5% | 1/10W |
| R405 | 1-216-089-00 | METAL CHIP | 47K | 5% | 1/10W |
| R406 | 1-216-065-00 | METAL CHIP | 4.7K | 5% | 1/10W |
| R409 | 1-216-049-00 | METAL CHIP | 1K | 5% | 1/10W |
| R410 | 1-216-049-00 | METAL CHIP | 1K | 5% | 1/10W |
| R412 | 1-216-055-00 | METAL CHIP | 1.8K | 5% | 1/10W |
| R413 | 1-216-055-00 | METAL CHIP | 1.8K | 5% | 1/10W |
| R414 | 1-216-070-00 | METAL CHIP | 7.5K | 5% | 1/10W |
| R415 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R416 | 1-216-059-00 | METAL CHIP | 2.7K | 5% | 1/10W |
| R417 | 1-202-852-00 | (UK)...SOLID | 4.7 | | 1/4W |
| R418 | 1-247-823-00 | (UK)...CARBON | 470 | 5% | 1/6W |

ELECTRICAL PARTS

| Ref.No. | Part No. | Description | | | |
|---|---|---|---|---|---|
| R419 | 1-202-858-00 | (UK)...SOLID | 4.7 | | 1/4W |
| R501 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R502 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R503 | 1-216-105-00 | METAL CHIP | 220K | 5% | 1/10W |
| R504 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R505 | 1-216-057-00 | METAL CHIP | 2.2K | 5% | 1/10W |
| R506 | 1-216-097-00 | METAL CHIP | 100K | 5% | 1/10W |
| R507 | 1-216-097-00 | METAL CHIP | 100K | 5% | 1/10W |
| R508 | 1-216-080-00 | METAL CHIP | 20K | 5% | 1/10W |
| R509 | 1-216-055-00 | METAL CHIP | 1.8K | 5% | 1/10W |
| R510 | 1-216-073-00 | METAL CHIP | 10K | 5% | 1/10W |
| R511 | 1-216-093-00 | METAL CHIP | 68K | 5% | 1/10W |
| R512 | 1-216-089-00 | METAL CHIP | 47K | 5% | 1/10W |
| R513 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R514 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R515 | 1-216-063-00 | METAL CHIP | 3.9K | 5% | 1/10W |
| R516 | 1-216-121-00 | METAL CHIP | 1M | 5% | 1/10W |
| R517 | 1-216-095-00 | METAL CHIP | 82K | 5% | 1/10W |
| R518 | 1-216-091-00 | METAL CHIP | 56K | 5% | 1/10W |
| R519 | 1-216-073-00 | METAL CHIP | 10K | 5% | 1/10W |
| R520 | 1-216-075-00 | METAL CHIP | 12K | 5% | 1/10W |
| R521 | 1-216-097-00 | METAL CHIP | 100K | 5% | 1/10W |
| R523 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R524 | 1-216-067-00 | METAL CHIP | 5.6K | 5% | 1/10W |
| R525 | 1-216-089-00 | METAL CHIP | 47K | 5% | 1/10W |
| R526 | 1-216-089-00 | METAL CHIP | 47K | 5% | 1/10W |
| R527 | 1-216-077-00 | METAL CHIP | 15K | 5% | 1/10W |
| R528 | 1-216-065-00 | METAL CHIP | 4.7K | 5% | 1/10W |
| R529 | 1-216-073-00 | METAL CHIP | 10K | 5% | 1/10W |
| R530 | 1-216-073-00 | METAL CHIP | 10K | 5% | 1/10W |
| R531 | 1-216-073-00 | METAL CHIP | 10K | 5% | 1/10W |
| R532 | 1-216-073-00 | METAL CHIP | 10K | 5% | 1/10W |
| R533 | 1-216-073-00 | METAL CHIP | 10K | 5% | 1/10W |
| R534 | 1-216-009-00 | METAL CHIP | 22 | 5% | 1/10W |
| R535 | 1-216-009-00 | METAL CHIP | 22 | 5% | 1/10W |
| R536 | 1-216-071-00 | METAL CHIP | 8.2K | 5% | 1/10W |
| R538 | 1-216-065-00 | METAL CHIP | 4.7K | 5% | 1/10W |
| R539 | 1-216-134-00 | METAL CHIP | 2.2 | 5% | 1/8W |
| R540 | 1-216-134-00 | METAL CHIP | 2.2 | 5% | 1/8W |
| R541 | 1-216-061-00 | METAL CHIP | 3.3K | 5% | 1/10W |
| R542 | 1-216-057-00 | METAL CHIP | 2.2K | 5% | 1/10W |
| R543 | 1-216-065-00 | METAL CHIP | 4.7K | 5% | 1/10W |
| R544 | 1-216-134-00 | METAL CHIP | 2.2 | 5% | 1/8W |
| R545 | 1-216-134-00 | METAL CHIP | 2.2 | 5% | 1/8W |
| R547 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R548 | 1-216-089-00 | METAL CHIP | 47K | 5% | 1/10W |
| R549 | 1-216-083-00 | METAL CHIP | 27K | 5% | 1/10W |
| R550 | 1-216-121-00 | METAL CHIP | 1M | 5% | 1/10W |
| R552 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R553 | 1-216-089-00 | METAL CHIP | 47K | 5% | 1/10W |
| R554 | 1-216-134-00 | METAL CHIP | 2.2 | 5% | 1/8W |
| R555 | 1-216-134-00 | METAL CHIP | 2.2 | 5% | 1/8W |
| R556 | 1-216-134-00 | METAL CHIP | 2.2 | 5% | 1/8W |
| R557 | 1-216-134-00 | METAL CHIP | 2.2 | 5% | 1/8W |
| R558 | 1-216-097-00 | METAL CHIP | 100K | 5% | 1/10W |
| R559 | 1-216-117-00 | METAL CHIP | 680K | 5% | 1/10W |

ELECTRICAL PARTS

| Ref.No. | Part No. | Description | | | |
|---|---|---|---|---|---|
| R560 | 1-216-266-00 | METAL CHIP | 680K | 5% | 1/8W |
| R561 | 1-247-903-00 | CARBON | 1M | 5% | 1/6W |
| R562 | 1-247-895-00 | CARBON | 470K | 5% | 1/6W |
| R563 | 1-216-053-00 | METAL CHIP | 1.5K | 5% | 1/10W |
| R564 | 1-216-073-00 | METAL CHIP | 10K | 5% | 1/10W |
| R601 | 1-216-214-00 | METAL CHIP | 4.7K | 5% | 1/8W |
| R603 | 1-216-065-00 | METAL CHIP | 4.7K | 5% | 1/10W |
| R604 | 1-216-059-00 | METAL CHIP | 2.7K | 5% | 1/10W |
| R605 | 1-216-338-11 | METAL CHIP | 30K | 1% | 1/10W |
| R606 | 1-216-338-11 | METAL CHIP | 30K | 1% | 1/10W |
| R607 | 1-216-065-00 | METAL CHIP | 4.7K | 5% | 1/10W |
| R608 | 1-216-329-11 | METAL CHIP | 5.1K | 1% | 1/10W |
| R609 | 1-216-085-00 | METAL CHIP | 33K | 5% | 1/10W |
| R610 | 1-216-049-00 | METAL CHIP | 1K | 5% | 1/10W |
| R611 | 1-216-097-00 | METAL CHIP | 100K | 5% | 1/10W |
| R612 | 1-216-065-00 | METAL CHIP | 4.7K | 5% | 1/10W |
| R613 | 1-216-097-00 | METAL CHIP | 100K | 5% | 1/10W |
| R614 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R615 | 1-216-065-00 | METAL CHIP | 4.7K | 5% | 1/10W |
| R616 | 1-216-065-00 | METAL CHIP | 4.7K | 5% | 1/10W |
| R617 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R618 | 1-216-089-00 | METAL CHIP | 47K | 5% | 1/10W |
| R619 | 1-216-065-00 | METAL CHIP | 4.7K | 5% | 1/10W |
| R620 | 1-216-065-00 | METAL CHIP | 4.7K | 5% | 1/10W |
| R621 | 1-216-085-00 | METAL CHIP | 33K | 5% | 1/10W |
| R622 | 1-216-121-00 | METAL CHIP | 1M | 5% | 1/10W |
| R623 | 1-216-093-00 | METAL CHIP | 68K | 5% | 1/10W |
| R624 | 1-216-065-00 | METAL CHIP | 4.7K | 5% | 1/10W |
| R625 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R626 | 1-216-101-00 | METAL CHIP | 150K | 5% | 1/10W |
| R628 | 1-216-101-00 | METAL CHIP | 150K | 5% | 1/10W |
| R630 | 1-216-111-00 | METAL CHIP | 390K | 5% | 1/10W |
| R631 | 1-216-099-00 | METAL CHIP | 120K | 5% | 1/10W |
| R632 | 1-216-103-00 | METAL CHIP | 180K | 5% | 1/10W |
| R633 | 1-216-095-00 | METAL CHIP | 82K | 5% | 1/10W |
| R634 | 1-216-089-00 | METAL CHIP | 47K | 5% | 1/10W |
| R635 | 1-216-073-00 | METAL CHIP | 10K | 5% | 1/10W |
| R801 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R802 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R805 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R806 | 1-216-109-00 | METAL CHIP | 330K | 5% | 1/10W |
| R807 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R808 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R809 | 1-216-081-00 | METAL CHIP | 22K | 5% | 1/10W |
| R810 | 1-216-102-00 | METAL CHIP | 160K | 5% | 1/10W |
| R811 | 1-216-104-00 | METAL CHIP | 200K | 5% | 1/10W |
| R812 | 1-216-104-00 | METAL CHIP | 200K | 5% | 1/10W |
| R813 | 1-216-106-00 | METAL CHIP | 240K | 5% | 1/10W |
| R814 | 1-216-068-00 | METAL CHIP | 6.2K | 5% | 1/10W |
| R815 | 1-216-089-00 | METAL CHIP | 47K | 5% | 1/10W |
| R816 | 1-216-101-00 | METAL CHIP | 150K | 5% | 1/10W |
| R817 | 1-216-087-00 | METAL CHIP | 39K | 5% | 1/10W |
| R818 | 1-216-097-00 | METAL CHIP | 100K | 5% | 1/10W |
| R819 | 1-247-791-00 | CARBON | 22 | 5% | 1/6W |
| RV1 | 1-237-091-11 | RES, ADJ, METAL GLAZE 100K | | | |
| RV2 | 1-237-091-11 | RES, ADJ, METAL GLAZE 100K | | | |
| RV301 | 1-237-092-11 | RES, VAR, CARBON 10K/10K (VOLUME) | | | |

ELECTRICAL PARTS

| Ref.No. | Part No. | Description |
|---|---|---|
| RV501 | 1-237-090-11 | RES, ADJ, METAL GLAZE 22K |
| RV502 | 1-237-090-11 | RES, ADJ, METAL GLAZE 22K |
| S401 | 1-554-123-00 | SWITCH, SLIDE (POWER) |
| S501 | 1-563-093-11 | JACK (LASER ON) |
| S801 | 1-553-198-00 | SWITCH, LEAF |
| S802 | 1-554-911-11 | SWITCH, LEAF (OPEN/CLOSE) |
| S803 | 1-554-371-00 | SWITCH, TACT (PLAY-MODE) |
| S804 | 1-554-371-00 | SWITCH, TACT (REMEIN/ENTER) |
| S805 | 1-554-371-00 | SWITCH, TACT (KEY-MODE) |
| S806 | 1-554-371-00 | SWITCH, TACT (PLAY/PAUSE) |
| S807 | 1-554-371-00 | SWITCH, TACT (FF) |
| S808 | 1-554-371-00 | SWITCH, TACT (FR) |
| S809 | 1-554-371-00 | SWITCH, TACT (STOP) |
| X601 | 1-567-540-11 | VIBRATOR, CRYSTAL |

ACCESSORY & PACKING MATERIAL

| Part No. | Description |
|---|---|
| 1-463-691-11 | (US).....ADAPTOR, AC (AC-930A(U)) |
| 1-463-694-11 | (Canadian)...ADAPTOR, AC (AC-930(CA)) |
| 1-463-700-11 | (UK).....ADAPTOR, AC (AC-930A) |
| 1-463-701-11 | (AUS).....ADAPTOR, AC (AC-930) |
| 1-463-702-11 | (E).....ADAPTOR, AC (AC-950W) |
| 1-463-705-11 | (AEP, DUTCH, FRENCH)...ADAPTOR, AC (AC-930 AEP) |
| 1-526-565-00 | (E).....AC PLUG ADAPTOR |
| 1-555-658-21 | CORD, CONNECTION |
| 1-558-395-21 | (E)....CORD (WITH DC PLUG) |
| 2-111-801-01 | (US, Canadian, AEP, UK, E, AUS, FRENCH)...BELT, CARRYING |
| 4-913-882-01 | (DUTCH).....BELT, CARRYING |
| 2-111-802-01 | CASE, CARRYING |
| 3-570-631-91 | BAG, POLYETHYLENE |
| 3-701-625-00 | (US, Canadian, AEP, UK, FRENCH)...BAG, POLYETHYLENE |
| 3-760-930-13 | (AEP, UK, FRENCH).....MANUAL, INSTRUCTION |
| 3-760-931-12 | (AUS).....MANUAL, INSTRUCTION |
| 3-760-931-13 | (E).....MANUAL, INSTRUCTION |
| 3-760-931-22 | (US, Canadian).....MANUAL, INSTRUCTION |
| 3-760-931-31 | (Canadian).....MANUAL, INSTRUCTION |
| 3-760-931-41 | (AEP, FRENCH).....MANUAL, INSTRUCTION |
| 3-765-262-11 | (DUTCH).....MANUAL, INSTRUCTION |
| 3-795-629-11 | (AEP, DUTCH, FRENCH)...INSTRUCTION |
| 3-795-748-21 | (US)....SAFETY INSTRUCTIONS, HEADPHONE |
| 4-907-095-02 | SHEET, PROTECTION |
| 4-912-654-01 | CUSHION (RIGHT) |
| 4-912-655-01 | CUSHION (LEFT) |
| 4-913-801-01 | (AEP, UK, AUS, FRENCH)...SLEEVE, ACCESSORY |
| 4-913-804-01 | (AEP, UK, AUS, FRENCH)...SLEEVE, ACCESSORY |
| 4-913-804-02 | (US, Canadian, E, DUTCH)...CARTON, ACCESSORY |
| 4-913-802-02 | (US).....INDIVIDUAL CARTON |
| 4-913-816-01 | (AEP, UK, E, AUS, FRENCH)...INDIVIDUAL CARTON |
| 4-913-823-01 | (Canadian).....INDIVIDUAL CARTON |
| 4-913-870-01 | (DUTCH).....INDIVIDUAL CARTON |
| 8-952-266-94 | (FRENCH).....MDR-A10L/B SET |

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9-952-109-91)

**Sony Corporation**

# SL-C/710/711

# TAPE PATH ADJUSTMENT GUIDE

March, 1984

## LIST OF CHASSIS TYPES

| NTSC SYSTEM | | | |
|---|---|---|---|
| C TYPE | 710 TYPE | 711 TYPE | |
| SL-5400 | SL-5000 | SL-2000 | SL-2406 |
| SL-5600 | SL-5010 | SL-2001 | SL-2408C |
| SL-5800 | SL-5020 | SL-2005 | SL-2410 |
| | SL-5100 | SL-2300 | SL-2415 |
| | SL-5100E | SL-2305 | SL-2500 |
| | SL-5101 | SL-2400 | SL-2700 |
| | SL-5200 | SL-2400C | SL-2700B |
| | | SL-2401 | SL-2710 |
| | | SL2405 | SL-2710B |
| | | SL-2405C | |

| CCIR SYSTEM | | | |
|---|---|---|---|
| C TYPE | 710 TYPE | 711 TYPE | |
| SL-5400MD | SL-5000MD | SL-C9AS | SL-C40UB |
| SL-C5AS | SL-C6AS | SL-C9E | SL-C44PS |
| SL-C5CH | SL-C6E | SL-C9ES | SL-C80AS |
| SL-C5E | SL-C6EC | SL-C9ECS | SL-C80E |
| SL-C5EC | SL-C6EI | SL-C9F | SL-C80SA |
| SL-C5EI | SL-C6ES | SL-C9UB | SL-C88EC |
| SL-C5SA | SL-C6F | SL-C20E | SL-F1E |
| SL-C5UB | SL-C6SA | SL-C20UB | SL-F1F |
| SL-C7E | SL-C6UB | SL-C24PS | SL-F1UB |
| SL-C7EC | SL-C6UB MKII | SL-C30E | SL-T20ME |
| SL-C7EI | SL-C8SA | SL-C30HK | SL-T30ME |
| SL-C7F | SL-T6ME | SL-C30PS | SL-T50ME |
| SL-C7SA | SL-T6PS | SL-C30SA | |
| SL-C7UB | | SL-C30UB | |
| SL-T7ME | | SL-C33EC | |
| SL-T7MER | | SL-C34AS | |
| SL-T9 | | SL-C34SA | |
| SL-T9ME | | SL-C35AS | |
| SL-T9MER | | SL-C40ES | |

SONY®

Consumer VIDEO

## TABLE OF CONTENTS


| Title | Page |
|---|---|
| **LIST OF CHASSIS TYPES** | 1 |
| **SECTION 1 SL-C/710 TYPE (NTSC SYSTEM)** | |
| 1-1. Terminology | 3 |
| 1-2. Preparations for Adjustment | 3 |
| 1-3. Entrance Side Adjustment | 4 |
| 1-4. Exit Side Adjustment | 5 |
| 1-5. Audio/CTL Position Adjustment | 7 |
| 1-6. Audio Height Adjustment | 8 |
| 1-7. Self-recorded RF Output Waveform Check | 9 |
| 1-8. Pairing Check | 9 |
| 1-9. Tape Running Development Chart | 10 |
| **SECTION 2 SL-C/710 TYPE (CCIR SYSTEM)** | |
| 2-1. Terminology | 11 |
| 2-2. Preparations for Adjustment | 11 |
| 2-3. Entrance Side Adjustment | 12 |
| 2-4. Exit Side Adjustment | 13 |
| 2-5. Audio/CTL Position Adjustment | 15 |
| 2-6. Audio Height Adjustment | 16 |
| 2-7. Self-recorded RF Output Waveform Check | 17 |
| 2-8. Pairing Check | 17 |
| 2-9. Tape Running Development Chart | 18 |
| **SECTION 3 711 TYPE (NTSC SYSTEM)** | |
| 3-1. Terminology | 19 |
| 3-2. Preparations for Adjustment | 19 |
| 3-3. Entrance Side Adjustment | 20 |
| 3-4. Exit Side Adjustment | 22 |
| 3-5. S Reel Damage Check | 24 |
| 3-6. Audio/CTL Position Adjustment | 24 |
| 3-7. Audio Height Adjustment | 25 |
| 3-8. Self-recorded RF Output Waveform Check | 26 |
| 3-9. Pairing Check | 26 |
| 3-10. Tape Running Development Chart | 27 |
| **SECTION 4 711 TYPE (CCIR SYSTEM)** | |
| 4-1. Terminology | 28 |
| 4-2. Preparations for Adjustment | 28 |
| 4-3. Entrance Side Adjustment | 29 |
| 4-4. Exit Side Adjustment | 31 |
| 4-5. S Reel Damage Check | 33 |
| 4-6. Audio/CTL Position Adjustment | 33 |
| 4-7. Audio Height Adjustment | 34 |
| 4-8. Self-recorded RF Output Waveform Check | 35 |
| 4-9. Pairing Check | 35 |
| 4-10. Tape Running Development Chart | 36 |

# SECTION 1

## SL-C/710 (NTSC SYSTEM)

This adjustment is performed so that the tape runs correctly in a set position, and has a large effect on picture quality and interchangeability. Perform the adjustment in the order given below.

### 1-1. Terminology

The No. 0, 1 and 2 guides on the tape guide location diagram (Fig. 1-1) are called the entrance side guides, and No. 3, 4 and 5 guides are the exit side guides. When the alignment tape (KR5-1M) is played, the side to the left of center of the RF output waveform on the oscilloscope is called the "entrance side", and the waveform is mainly affected by the entrance side guides. The right side is called the "exit side" and is mainly affected by the exit side guides. (Fig. 1-2)

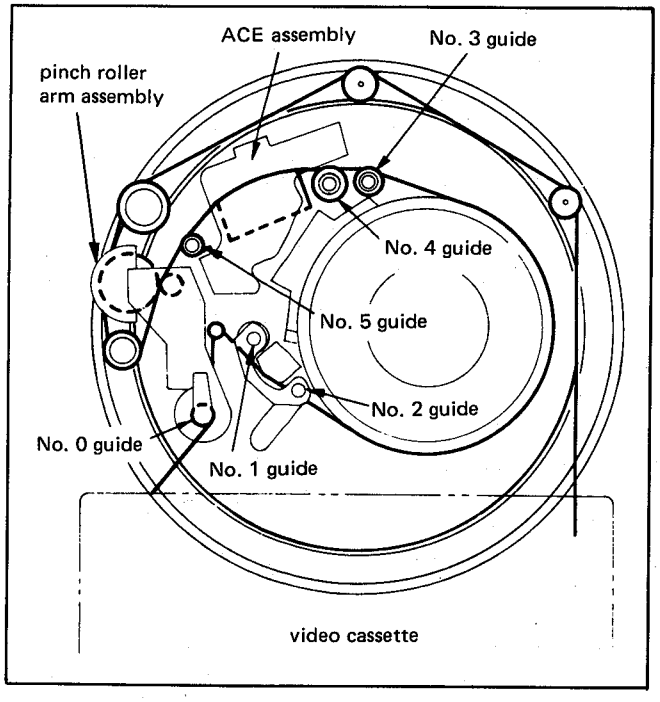



*Fig. 1-1 Tape Guide Location Diagram*

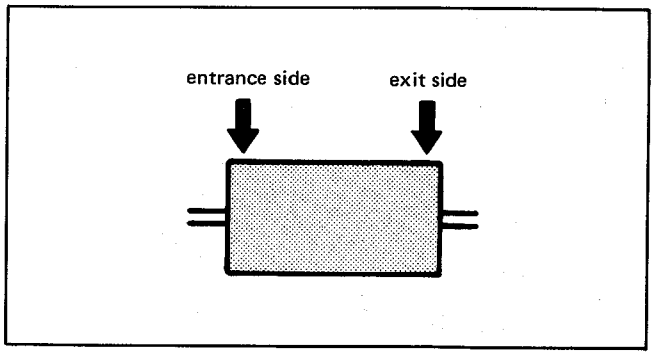



*Fig. 1-2 RF Output Waveform*

### 1-2. Preparations for Adjustment

1) Clean the tape running surface (tape guides, drum, capstan, pinch roller, ACE head, etc.) with a cleaning cloth dipped in methanol.
2) Connect the oscilloscope to RF board RF output pin and the external trigger to the switching pulse pin.
3) Play back the tracking portion of the alignment tape (KR5-1M).
4) Turn the tracking control knob to the position where the oscilloscope RF output waveform center portion is maximum.
5) Adjust oscilloscope V GAIN so that the RF output waveform center portion is 6cm on the oscilloscope. (Fig. 1-3)

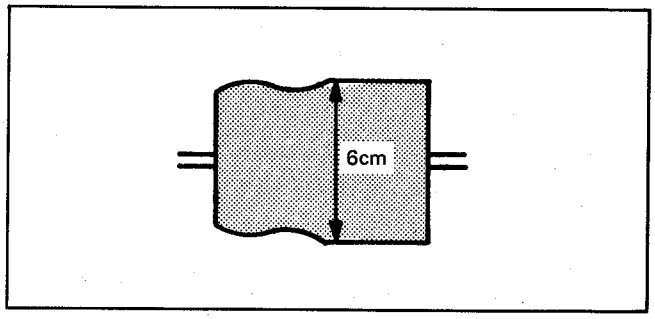



*Fig. 1-3*

6) Return the tracking control knob to center click and confirm that the RF output waveform is more than 5cm. (Fig. 1-4) When it is less than 5cm, refer to the section on CTL position adjustment and perform coarse adjustment.

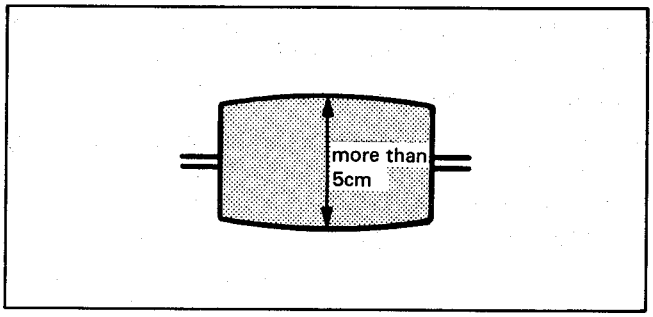



*Fig. 1-4 Center Click Waveform*

7) Turn the tracking control knob to the right (Fig. 1-6), as seen from the front, so that the center of the RF output waveform on the oscilloscope is 4cm. (Fig. 1-5) Normally, "2/3 right turn = 4cm waveform". Tape path adjustment is performed in this state. The following adjustments are all performed at 2/3 right turn waveform unless otherwise indicated.

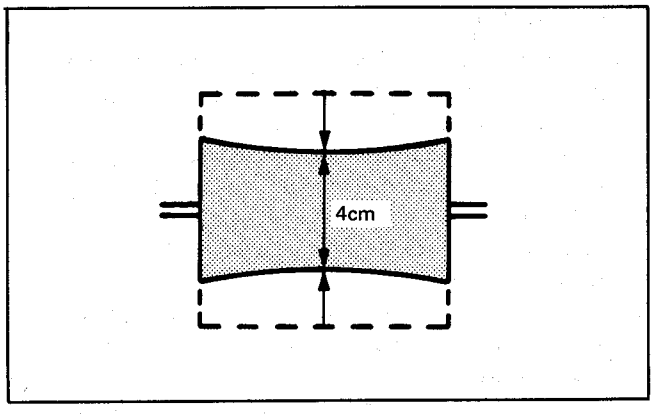



*Fig. 1-5 2/3 Right Turn Waveform*

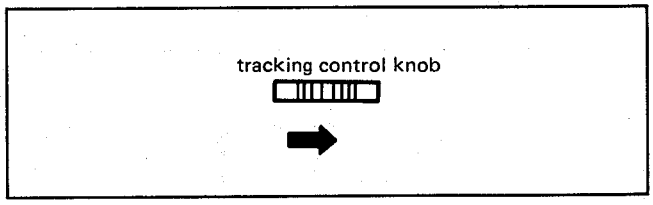



*Fig. 1-6 Right Turn*

**Note** 1): Accurate tape path adjustment cannot be performed if this state is not achieved. Be sure to do tape path adjustment in this state.

2): The adjustment guides have screw lock applied to secure them, so remove the screw lock with alcohol first.

### 1-3. Entrance Side Adjustment

The adjustment locations are the No. 0, 1 and 2 guides. No. 0 guide lower or upper flange and No. 1 and 2 guides upper flanges are adjusted to press the tape so that the RF output waveform is flat.

**Adjustment Procedure:**

1) Turn the No. 1 and 2 guide adjustment nuts counterclockwise, while observing with a dental mirror, so that the cleanance between the upper flange and the tape is 0.3 – 0.5mm. (Fig. 1-7)

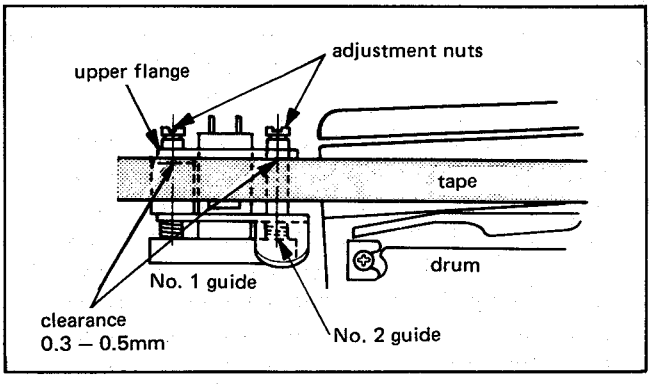



*Fig. 1-7*

2) While observing the RF output waveform, turn the ⊖ screw at the top of the No. 0 guide slowly to raise and lower the guide (after 30° turn, observe the waveform for 5 – 10 seconds), so that the RF output waveform entrance side is as shown in Fig. 1-8.

**Note:** Do not press the No. 0 guide screw hard when adjusting. As much as possible, utilize the turning force of the screw.

When No. 0 guide is raised, the number of peaks and valleys increases as shown in Fig. 1-9 ⓑ, and decreases when it is lowered. When the waveform fluctuates from ⓐ to ⓑ as shown in Fig. 1-9, adjust No. 0 guide so that a waveform becomes like the waveform in Fig. 1-8.

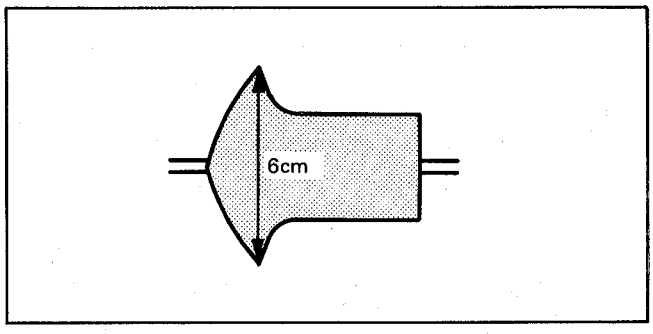



*Fig. 1-8 No. 0 Guide Waveform*

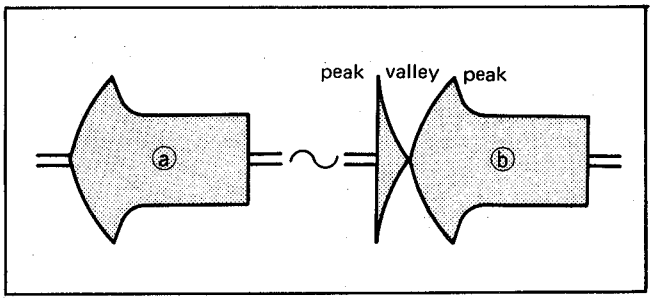



*Fig. 1-9 Fluctuation*

3) Turn No. 1 guide adjustment nut clockwise so that the RF output waveform entrance side is as shown in Fig. 1-10.

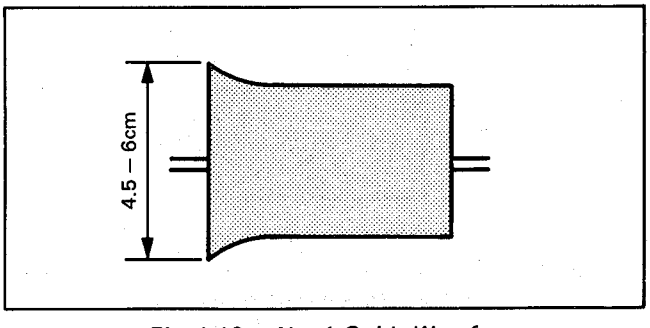



*Fig. 1-10 No. 1 Guide Waveform*

4) Turn No. 2 guide adjustment nut clockwise so that the RF output waveform entrance side is 4cm as shown in Fig. 1-11.

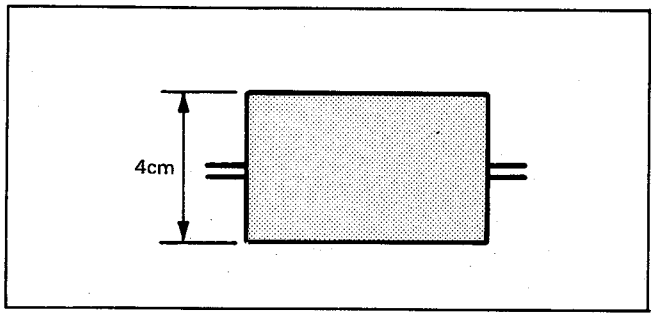



*Fig. 1-11 No. 2 Guide Waveform*

5) Check that the curl and the space between the No. 0, 1 and 2 guide flanges and the tape satisfy the specifications.

Curl: Less than 1mm for No. 0, 1 and 2 guides
Space: None for all three guides

**Note:** Curl, Space
When the guide flange presses the tape too much, the tape is distorted and curl results. When the flange is not pressing the tape, there is space between the tape and flange. Check these with a dental mirror. (Fig. 1-12)

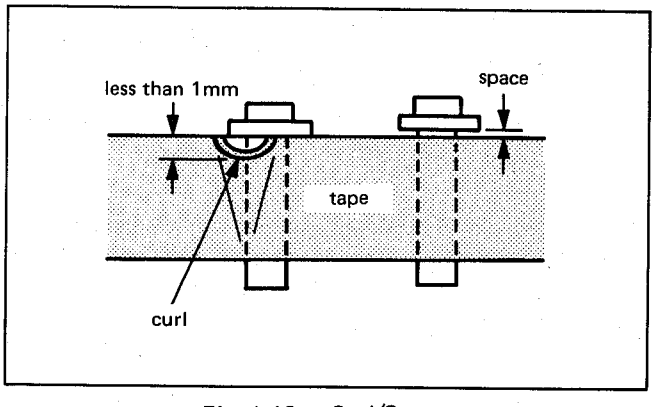



*Fig. 1-12 Curl/Space*

### 1-4. Exit Side Adjustment

The adjustment locations are No. 3, 4 and 5 guides and the ACE head. The exit guides all press the tape with the upper flange. For the exit side adjustment, when the guides are moved the CTL position changes, so perform the adjustment while constantly maintaining a 2/3 right turn waveform with the tracking control knob. (The center level must be 4cm or adjustment cannot be done accurately.)

**Adjustment Procedure:**

1) Turn No. 3, 4 and 5 guide adjustment nuts counter-clockwise, while observing with a dental mirror, so that the clearance between the upper flanges and the tape is 0.3 – 0.5mm. (Fig. 1-13)

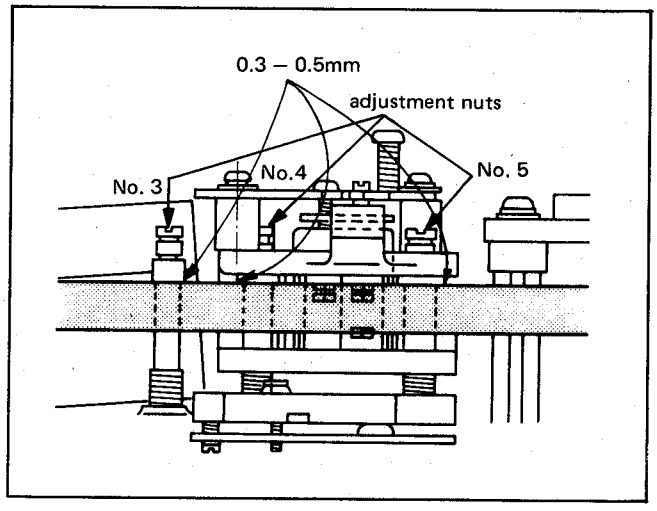



*Fig. 1-13 Exit Guide*

2) Loosen the ACE lock nut about 360°. (Fig. 1-14)

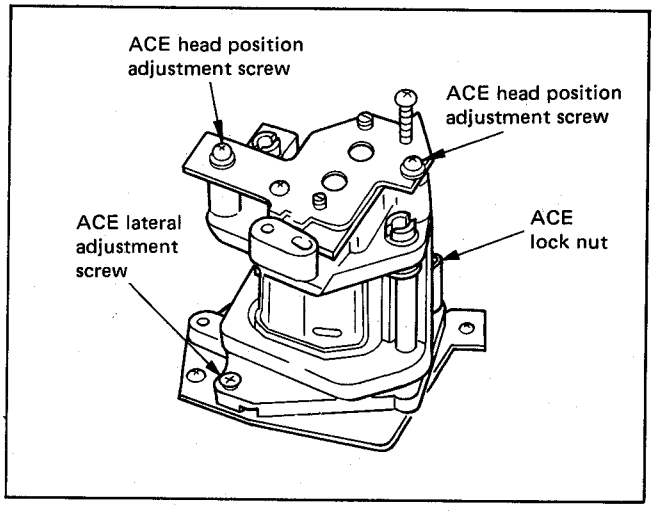



*Fig. 1-14 ACE Assembly*

3) While observing the RF output waveform, turn the ACE lateral adjustment screw slowly counter-clockwise, confirm that there are peaks and valleys as shown in Fig. 1-15 and stop turning.

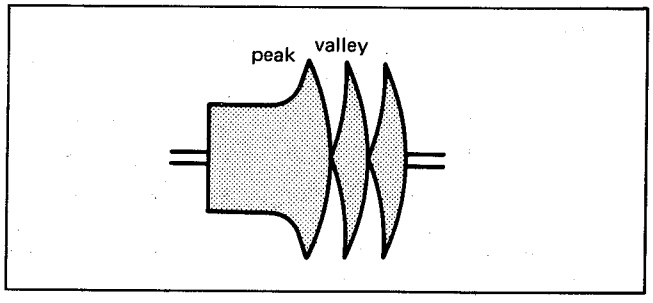



*Fig. 1-15*

4) While observing the RF output waveform, turn the ACE lateral adjustment screw slowly clockwise (after 30° turn, observe for 5 – 10 seconds), so that the waveform is as shown in Fig. 1-16. When the waveform fluctuates, adjust so that the part with the fewest peaks becomes the waveform in Fig. 1-16.

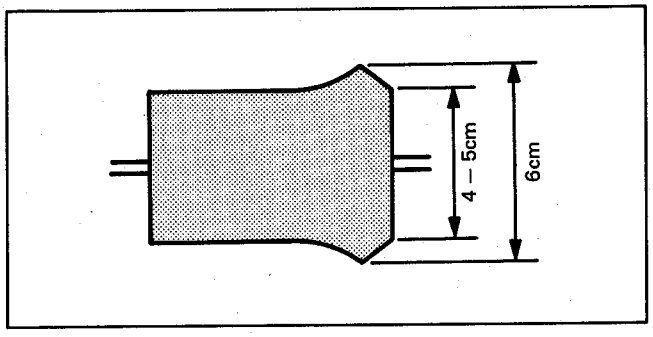



*Fig. 1-16 Lateral Waveform*

5) Turn the ACE lock nut clockwise with a screwdriver and tighten lightly. (Fig. 1-17)
Conform that the change in the RF waveform at this time is within 1cm at section A relative to the waveform in Fig. 1-16, when the center is 4cm (Fig. 1-18)

**Note:** If the nut is tightened too much, the waveform will change completely.

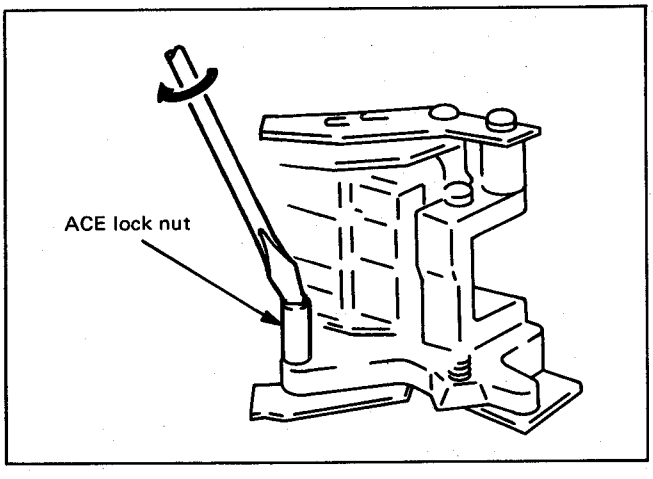



*Fig. 1-17*

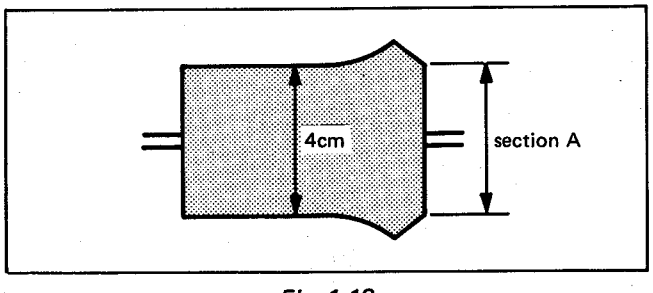



*Fig. 1-18*

6) Turn No. 5 guide adjustment nut clockwise so that the RF output waveform is as shown in Fig. 1-19.

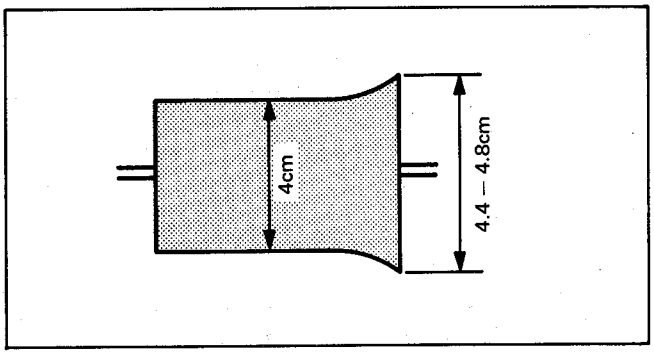



*Fig. 1-19 No. 5 Guide Waveform*

7) Turn No. 4 guide adjustment nut clockwise, so that the RF output waveform is as shown in Fig. 1-20.

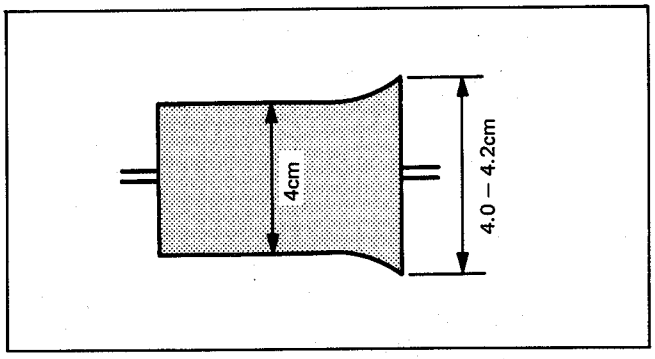



*Fig. 1-20 No. 4 Guide Waveform*

8) Turn the No. 3 guide adjustment nut clockwise, so that the RF output waveform exit portion marked by the arrows (Fig. 1-21) is 1 – 2mm lower than the state in Fig. 1-20.

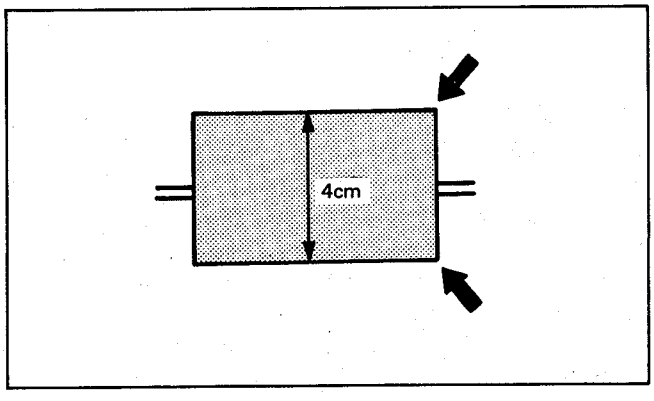



*Fig. 1-21 No. 3 Guide Waveform*

9) Check that the No. 3, 4 and 5 guides space and curl satisfy the specifications.
Space: None for all three guides
Curl: No. 3, 4 guides, less than 1mm. None for No. 5 guide.

### 1-5. Audio/CTL Position Adjustment

**1) Audio Head Azimuth Adjustment**

Refer to the section on "Audio Head (ACE ass'y) Azimuth Adjustment" in the Service Manual.

**Connection of Equipment:**

The connections of the equipment to the input/output terminals are shown in Fig. 1-22.

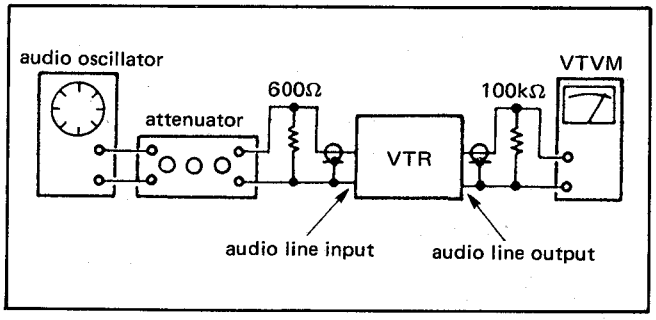



*Fig. 1-22 Connections*

(1) Terminate the audio line output terminal with a 100kΩ resistor and connect a VTVM.
(2) Play back the 5kHz signal segment of the alignment tape (KR5-1M).
(3) Adjust the azimuth adjustment screw on the audio head for a maximum VTVM reading. (See Fig. 1-22.)

**Note:** Loosen azimuth adjustment screw before the adjustment and tighten it after the completion.

**2) CTL Position Adjustment**

Adjust ACE head position so that the RF output waveform is maximum when the tracking control knob is at center click.
Refer to the section on "ACE Assembly Position Adjustment" in the Service Manual.

**Note:** Be sure to perform with tracking control knob at center click.

**Position Adjustment of ACE Assembly**

- This adjustment includes the mechanical head mounting position adjustment and the electrical tracking control center adjustment.
- The adjustment sequence is to perform the tracking control center adjustment and then the mechanical adjustment of the head mounting position.

If this sequence is reversed, poor tracking occurs.

(1) Connect a dual-trace oscilloscope as follows.
CH-1 . . . . . RF OUT
CH-2 . . . . . AUDIO OUT
Ext Trigger. . . . . SWITCHING PULSE OUT
(2) Play back (βII mode) the 1MHz segment of alignment tape (KR5-1M) (See Fig. 1-23).
(3) Set the tracking control to the center detent position and confirm that the output waveform level is maximum and the 0 level point of the audio signal appears at the Bch waveform point as shown in Fig. 1-23. If the specification is not satisfied, perform the following Step 4.

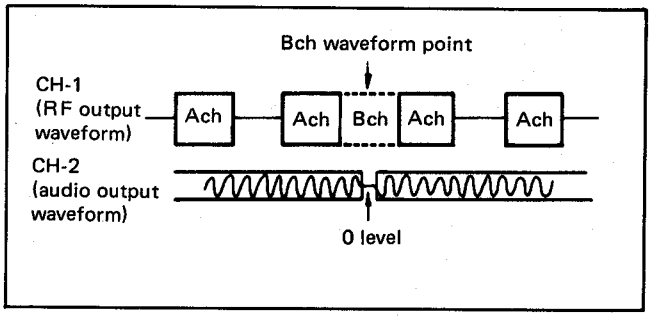



*Fig. 1-23 Position Adjustment of ACE Assembly (1)*

(4) Perform the tracking control center adjustment.
(5) Set the TRACKING control knob to its center detent point and play back the 1MHz segment of the alignment tape (KR5-1M).
(6) Loosen the two position adjusting screws of the ACE head and adjust the cut-out section of section A for maximum RF output waveform and a 0 level of audio signal at the Bch waveform point. (See Fig. 1-23.)

**Note:** Perform the adjustment so that the center of the cut-out section of the A section will almost match the center of the round hole.

(7) Play back the 1MHz segment of the alignment tape and confirm the proper picture appearance.
(8) Tighten the position adjusting screw of the ACE head.

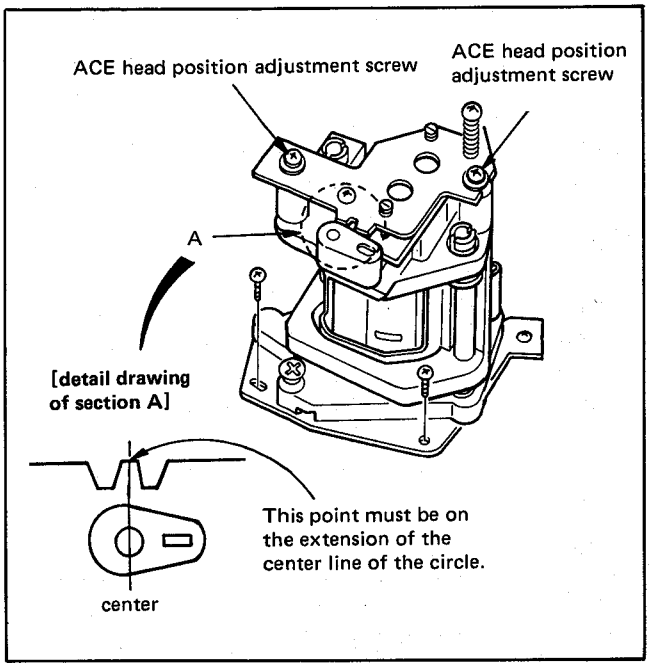

ACE head position adjustment screw
ACE head position adjustment screw
A
[detail drawing of section A]
This point must be on the extension of the center line of the circle.
center

*Fig. 1-24 Position Adjustment of ACE Assembly (2)*

If there is space at the bottom (Fig. 1-26 ② ), adjust by turning the height adjustment screw Ⓐ clockwise.
(Judge if there is space by pressing the parallel plate with a finger to see if there is play.)

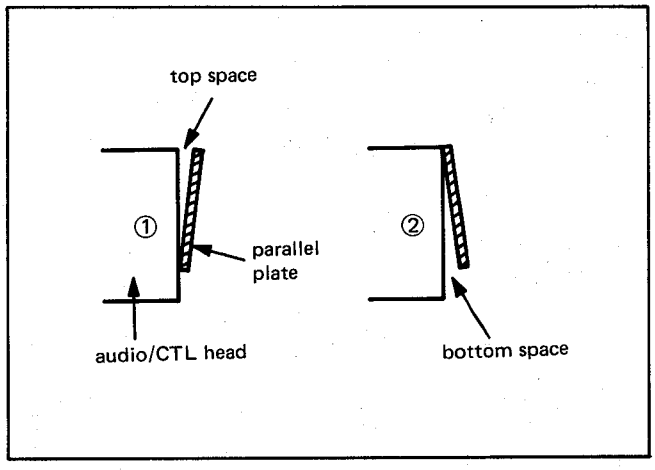



*Fig. 1-26*

### 1-6. Audio Height Adjustment

This adjustment is basically unnecessary, as it is preadjusted at the factory. The same applies to the repair ACE assembly. However, if the adjustment screw has been touched and it is absolutely necessary to adjust, perform the following procedure.

**Parallel Adjustment Relative to ACE Head Guide**

1) Place the parallel plate SL-0657 on No. 5 guide and audio/CTL head. (Fig. 1-25)

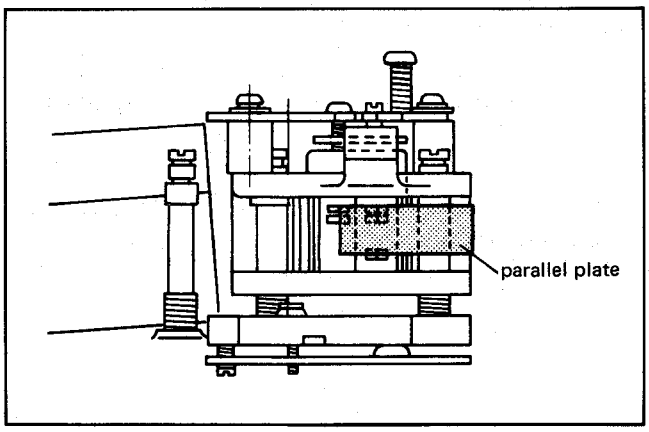



*Fig. 1-25*

2) With No. 5 guide as reference, confirm that there is no space between the audio/CTL head and the parallel plate. If there is space at the top (Fig. 1-26 ① ), adjust by turning the height adjustment screw Ⓐ counterclockwise. (Fig. 1-27)

3) Put KR5-1M into FWD.
4) Perform azimuth adjustment according to the Service Manual.
5) While observing the audio head with a dental mirror, match up the core upper edge and tape upper edge as in Fig. 1-28, with the two height adjustment screws and the azimuth adjustment screw.
Turn the two height adjustment screws in the same direction at the same angle, and the azimuth adjustment screw in the opposite direction at the same angle. Be sure to turn all three screws.

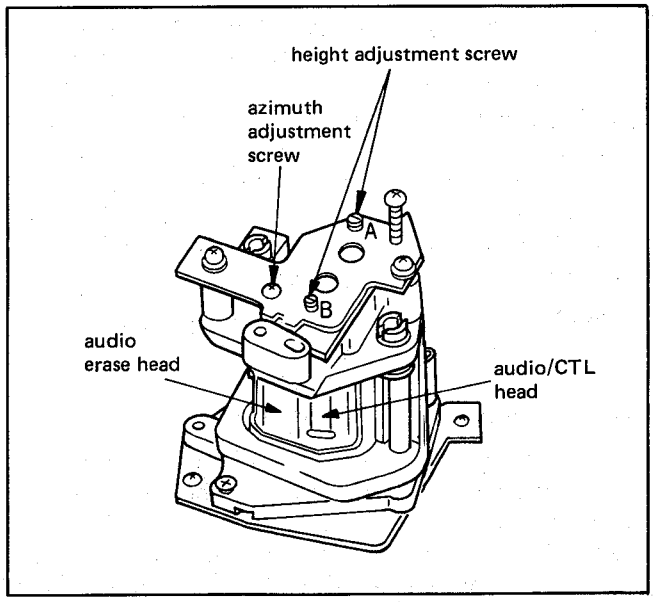



*Fig. 1-27*

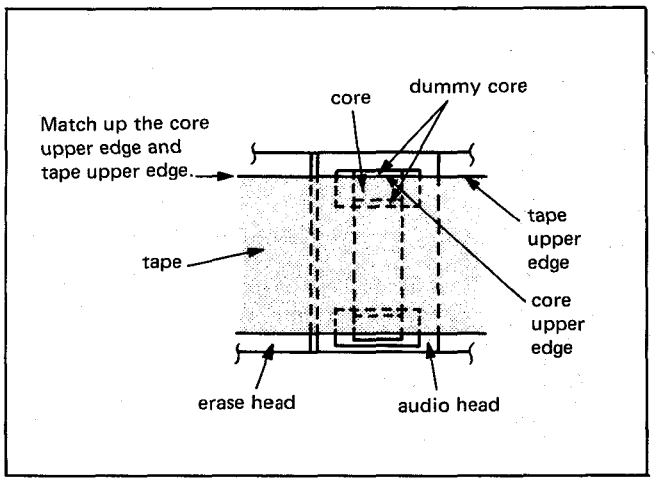



*Fig. 1-28*

6) From the position in 5), turn the two height adjustment screws clockwise 70° and turn the azimuth adjustment screw counterclockwise 70°. (This adjustment makes the tape upper edge 0.1mm above the core upper edge.)
   The ACE head adjustment affects tape path, so it is necessary to perform exit side tape path adjustment and CTL position and azimuth check and adjustment.
   Perform the exit side adjustment and audio/CTL position adjustment in the previous sections.

### 1-7. Self-Recorded RF Output Waveform Check

1) Set the tracking control knob to center click.
2) Record an on-the-air signal on an L-500 tape, rewind and play back.
3) Confirm that the RF output waveform satisfies the conditions in Fig. 1-29. If not, readjust tape path.

$$\textcircled{1}\ \frac{E\ min}{E\ max} \geqq 65\%$$

$$\textcircled{2}\ \text{at } 80\% \text{ interval, } \frac{E}{E\ max} \geqq 80\%$$

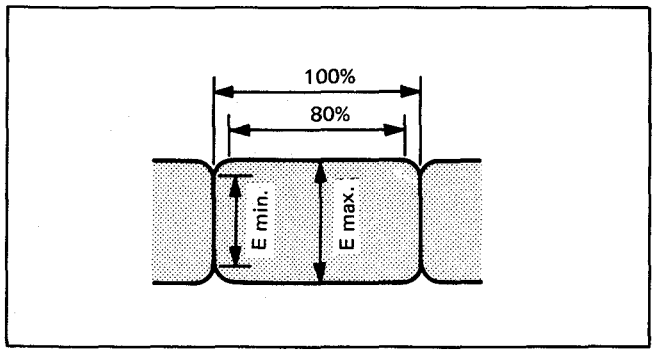



*Fig. 1-29*

### 1-8. Pairing Check

1) Set the tracking control knob to center click.
2) Record an on-the-air signal on an L-500 tape, rewind and play back.
3) Check CH-A, CH-B RF output levels.
4) Match up CH-A and CH-B RF output levels with RP board CH balance. (Fig. 1-30)

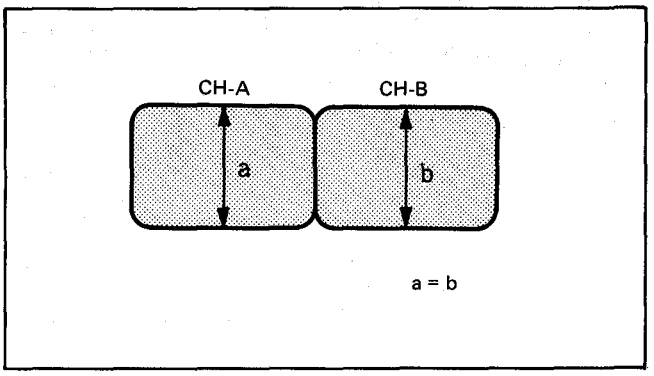



*Fig. 1-30*

5) Adjust oscilloscope V GAIN so that the RF output waveform on the oscilloscope is 5cm.
6) Turn the tracking control knob to the right, as seen from the front, and make the large output waveform 2cm. (Fig. 1-31)

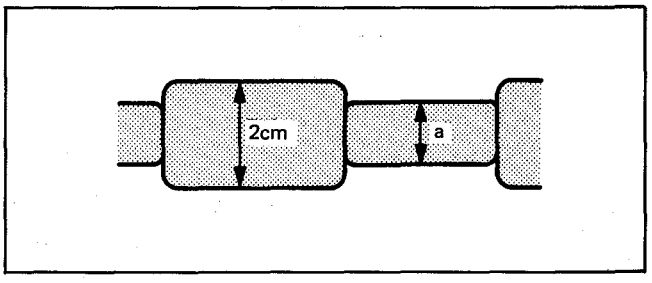
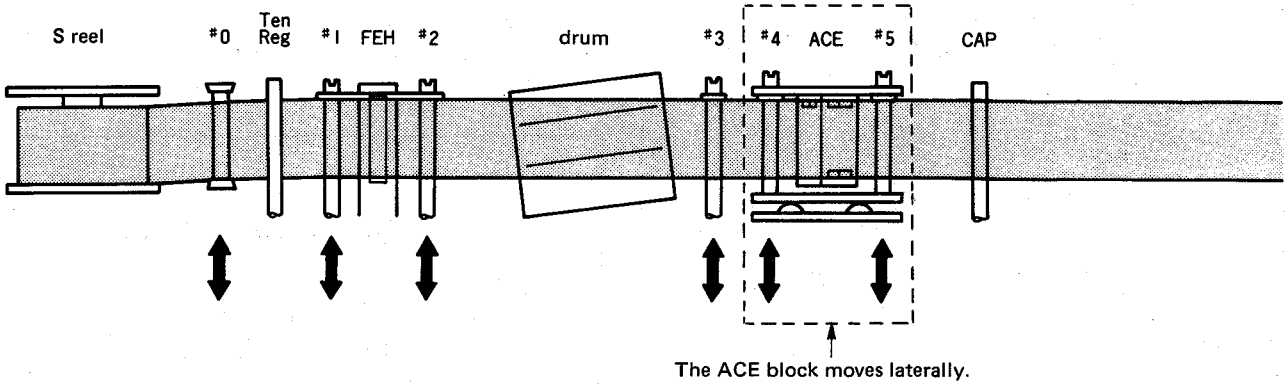



*Fig. 1-31*

7) At this time, check that the small output channel's output satisfies the specification.
   Specification: small output CH 1.0 – 2.0cm (Fig. 1-31 a )
8) Return oscilloscope V GAIN to its original state, and return RF output level to the state in 3) with CH balance.

## 1-9. Tape Running Development Chart




The arrows show the directions of the movement.

*Fig. 1-32*

# SECTION 2

## SL-C/710 (CCIR SYSTEM)

This adjustment is performed so that the tape runs correctly in a set position, and has a large effect on picture quality and interchangeability. Perform the adjustment in the order given below.

### 2-1. Terminology

The No. 0, 1 and 2 guides on the tape guide location diagram (Fig. 2-1) are called the entrance side guides, and No. 3, 4 and 5 guides are the exit side guides. When the alignment tape (KR5-2H) is played, the side to the left of center of the RF output waveform on the oscilloscope is called the "entrance side", and the waveform is mainly affected by the entrance side guides. The right side is called the "exit side" and is mainly affected by the exit side guides. (Fig. 2-2)

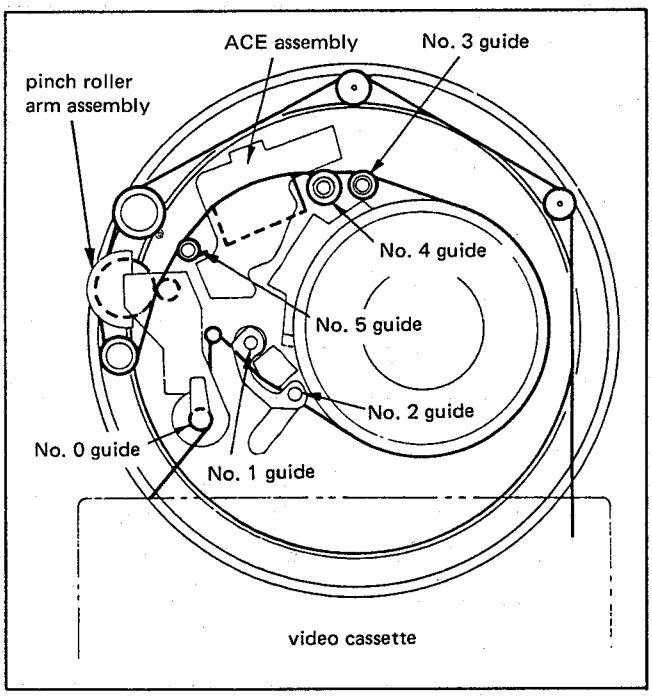



*Fig. 2-1 Tape Guide Location Diagram*

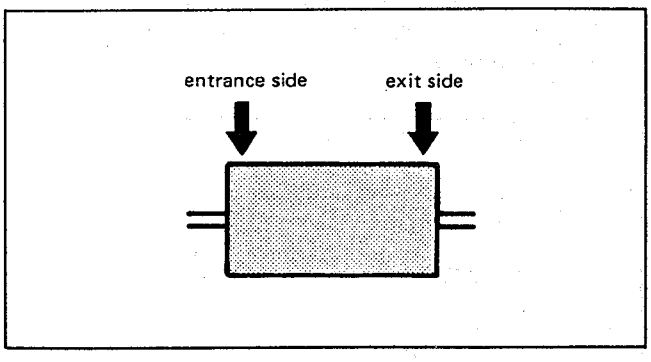



*Fig. 2-2 RF Output Waveform*

### 2-2. Preparations for Adjustment

1) Clean the tape running surfaces (tape guides, drum, capstan, pinch roller, ACE head, etc.) with a cleaning cloth dipped in methanol.
2) Connect the oscilloscope to RF board RF output pin and the external trigger to the switching pulse pin.
3) Play back the tracking portion of the alignment tape (KR5-2H).
4) Turn the tracking control knob to the position where the oscilloscope RF output waveform center portion is maximum.
5) Adjust oscilloscope V GAIN so that the RF output waveform center portion is 6cm on the oscilloscope. (Fig. 2-3)

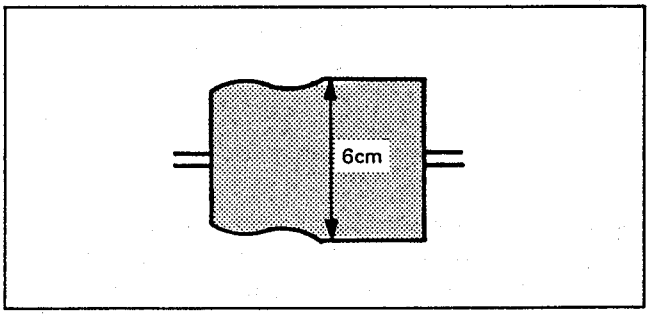



*Fig. 2-3*

6) Return the tracking control knob to center click and confirm that the RF output waveform is more than 5cm. (Fig. 2-4) When it is less than 5cm, refer to the section on CTL position adjustment and perform coarse adjustment.

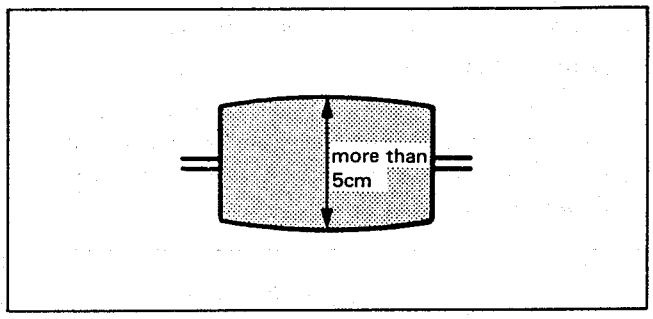



*Fig. 2-4 Center Click Waveform*

7) Turn the tracking control knob to the right (Fig. 2-6), as seen from the front, so that the center of the RF output waveform on the oscilloscope is 4cm. (Fig. 2-5) Normally, "2/3 right turn = 4cm waveform". Tape path adjustment is performed in this state. The following adjustments are all performed at 2/3 right turn waveform unless otherwise indicated.

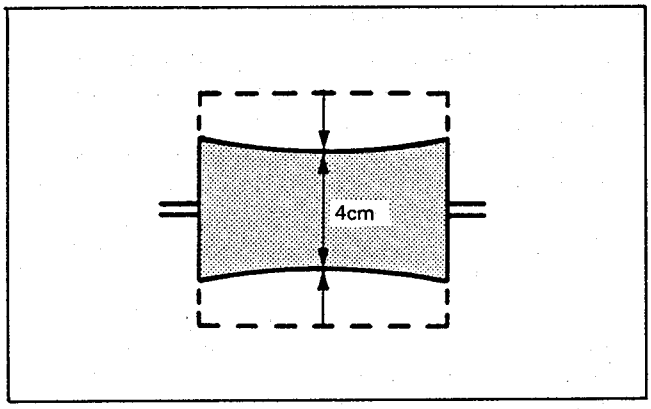



*Fig. 2-5 2/3 Right Turn Waveform*

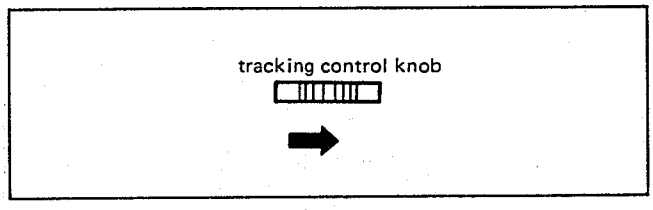



*Fig. 2-6 Right Turn*

**Note** 1): Accurate tape path adjustment cannot be performed if this state is not achieved. Be sure to do tape path adjustment in this state.

2): The adjustment guides have screw lock applied to secure them, so remove the screw lock with alcohol first.

### 2-3. Entrance Side Adjustment

The adjustment locations are the No. 0, 1 and 2 guides. No. 0 guide lower or upper flange and No. 1 and 2 guides upper flanges are adjusted to press the tape so that the RF output waveform is flat.

**Adjustment Procedure:**

1) Turn the No. 1 and 2 guide adjustment nuts counterclockwise, while observing with a dental mirror, so that the clearance between the upper flange and the tape is 0.3 – 0.5mm. (Fig. 2-7)

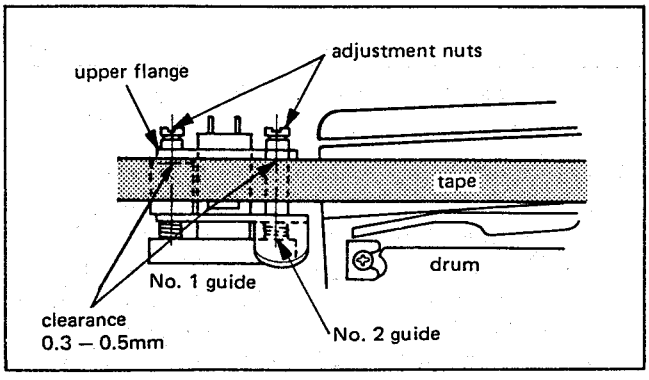



*Fig. 2-7*

2) While observing the RF output waveform, turn the ⊖ screw at the top of the No. 0 guide slowly to raise and lower the guide (after 30° turn, observe the waveform for 5 – 10 seconds), so that the RF output waveform entrance side is as shown in Fig. 2-8.

**Note:** Do not press the No. 0 guide screw hard when adjusting. As much as possible, utilize the turning force of the screw.

When No. 0 guide is raised, the number of peaks and valleys increases as shown in Fig. 2-9 ⓑ, and decreases when it is lowered. When the waveform fluctuates from ⓐ to ⓑ as shown in Fig. 2-9, adjust No. 0 guide so that a waveform becomes like the waveform in Fig. 2-8.

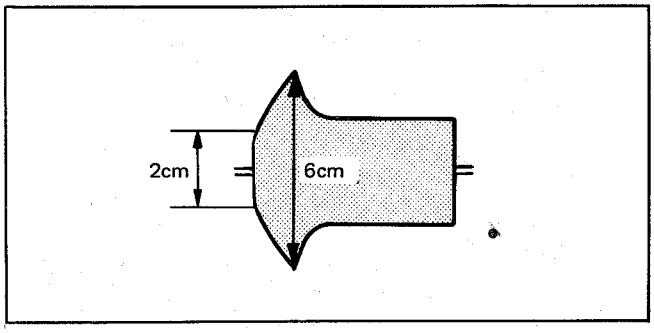



*Fig. 2-8 No. 0 Guide Waveform*

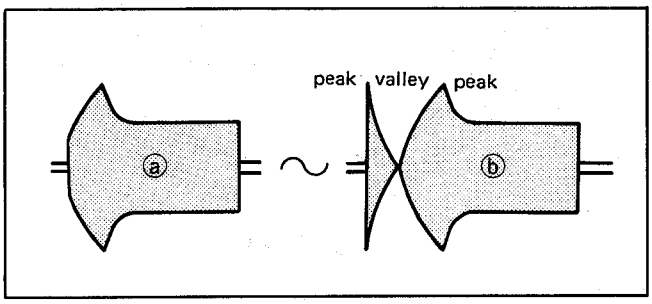



*Fig. 2-9 Fluctuation*

3) Turn No. 1 guide adjustment nut clockwise so that the RF output waveform entrance side is as shown in Fig. 2-10.

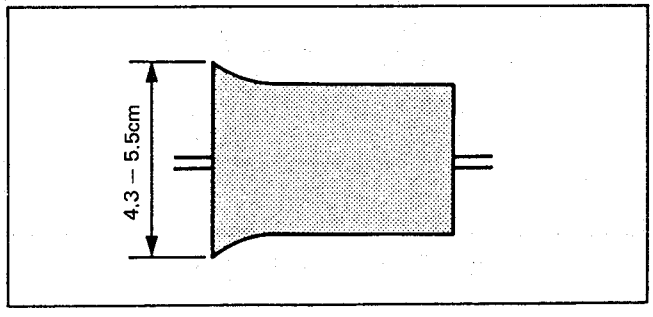



*Fig. 2-10 No. 1 Guide Waveform*

4) Turn No. 2 guide adjustment nut clockwise so that the RF output waveform entrance side is 4cm as shown in Fig. 2-11.

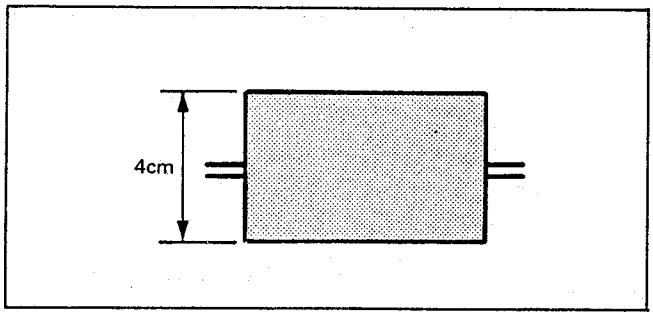



*Fig. 2-11 No. 2 Guide Waveform*

5) Check that the curl and the space between the No. 0, 1 and 2 guide flanges and the tape satisfy the specifications.

Curl: Less than 1mm for No. 0, 1 and 2 guides
Space: None for all three guides

**Note:** Curl, Space
When the guide flange presses the tape too much, the tape is distorted and curl results. When the flange is not pressing the tape, there is space between the tape and flange. Check these with a dental mirror. (Fig. 2-12)

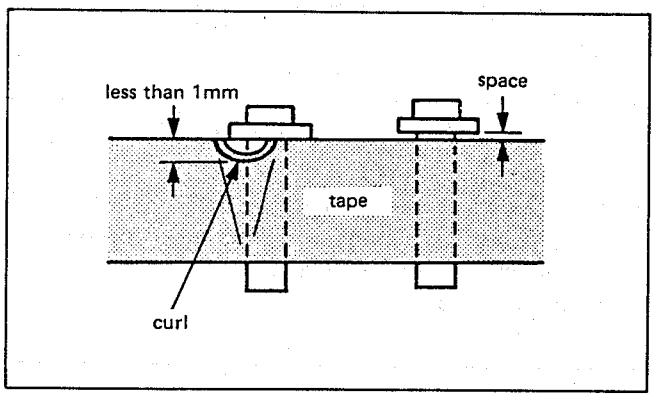



*Fig. 2-12 Curl/Space*

### 2-4. Exit Side Adjustment

The adjustment locations are No. 3, 4 and 5 guides and the ACE head. The exit guides all press the tape with the upper flange. For the exit side adjustment, when the guides are moved the CTL position changes, so perform the adjustment while constantly maintaining a 2/3 right turn waveform with the tracking control knob. (The center level must be 4cm or adjustment cannot be done accurately.)

**Adjustment Procedure:**

1) Turn No, 3, 4 and 5 guide adjustment nuts counter-clockwise, while observing with a dental mirror, so that the clearance between the upper flanges and the tape is 0.3 – 0.5mm. (Fig. 2-13)

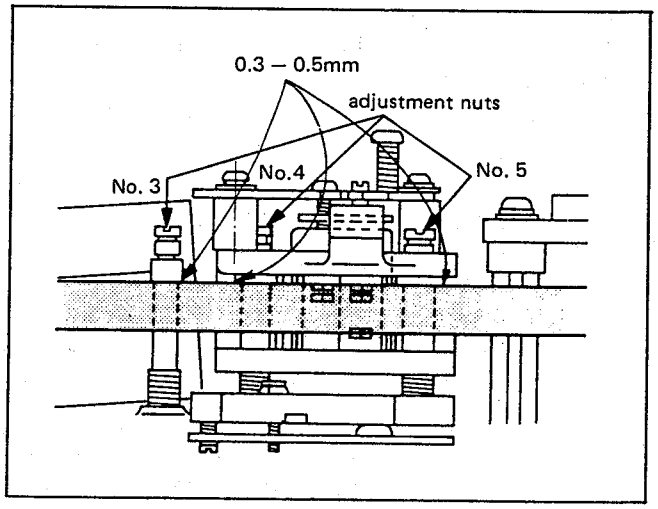



*Fig. 2-13 Exit Guide*

2) Loosen the ACE lock nut about 360°. (Fig. 2-14)

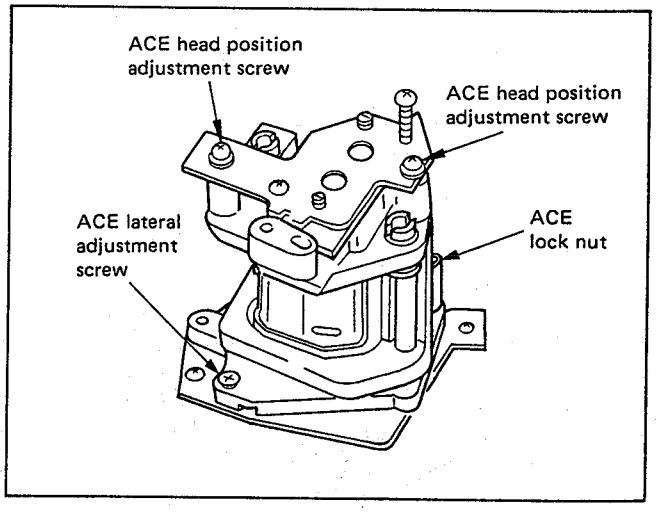



*Fig. 2-14 ACE Assembly*

3) While observing the RF output waveform, turn the ACE lateral adjustment screw slowly counter-clockwise, confirm that there are peaks and valleys as shown in Fig. 2-15 and stop turning.

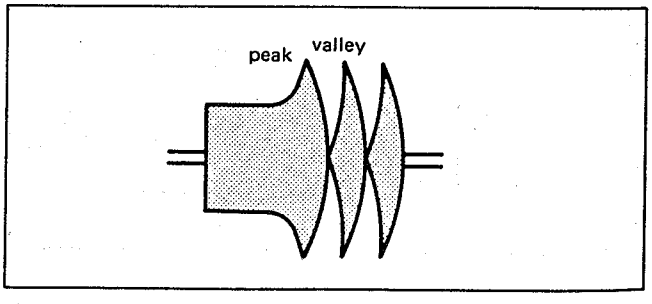



*Fig. 2-15*

4) While observing the RF output waveform, turn the ACE lateral adjustment screw slowly clockwise (after 30° turn, observe for 5 – 10 seconds), so that the waveform is as shown in Fig. 2-16. When the waveform fluctuates, adjust so that the part with the fewest peaks becomes the waveform in Fig. 2-16.

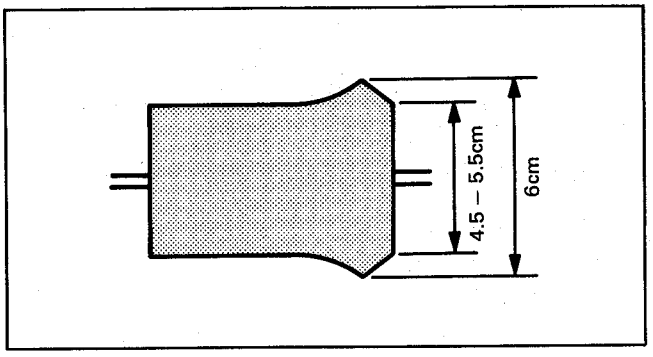



*Fig. 2-16 Lateral Waveform*

5) Turn the ACE lock nut clockwise with a screwdriver and tighten lightly. (Fig. 2-17)
Confirm that the change in the RF waveform at this time is within 1cm at section A relative to the waveform in Fig. 2-16, when the center is 4cm. (Fig. 2-18)

**Note:** If the nut is tightened too much, the waveform will change completely.

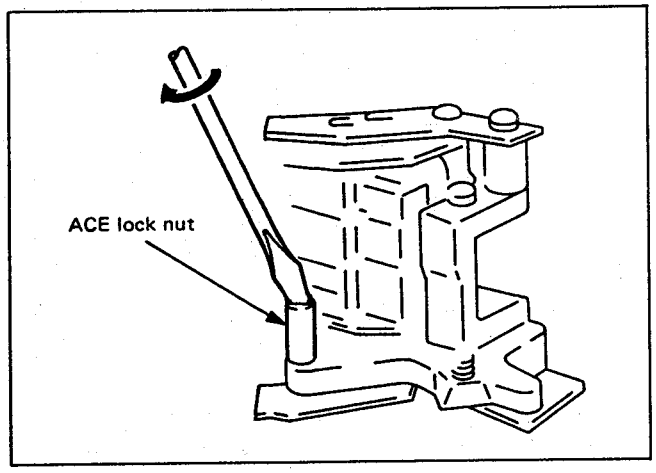



*Fig. 2-17*

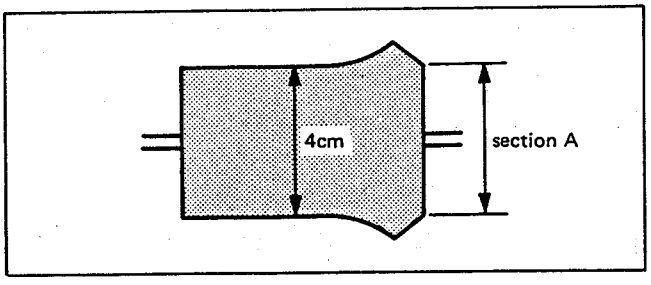



*Fig. 2-18*

6) Turn No. 5 guide adjustment nut clockwise so that the RF output waveform is as shown in Fig. 2-19.

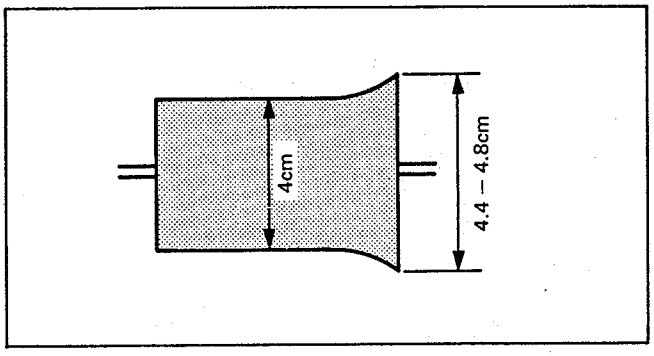



*Fig. 2-19 No. 5 Guide Waveform*

7) Turn No. 4 guide adjustment nut clockwise, so that the RF output waveform is as shown in Fig. 2-20.

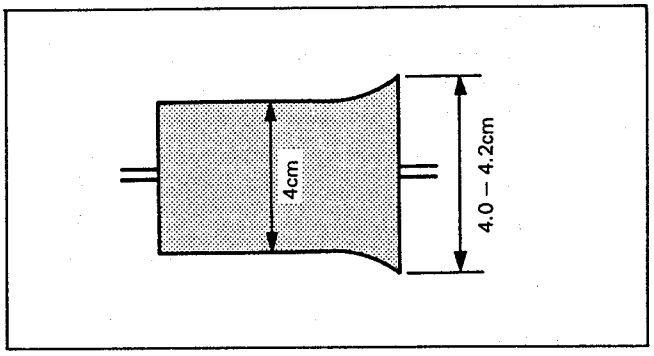



*Fig. 2-20 No. 4 Guide Waveform*

8) Turn the No. 3 guide adjustment nut clockwise, so that the RF output waveform exit portion marked by the arrows (Fig. 2-21) is 1 – 2mm lower than the state in Fig. 2-20.

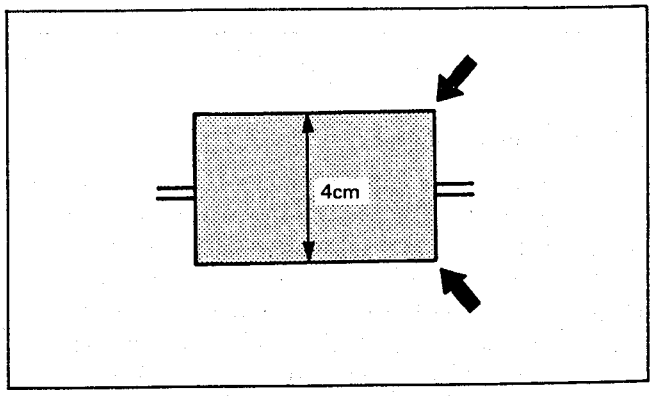



*Fig. 2-21 No. 3 Guide Waveform*

9) Check that the No. 3, 4 and 5 guides space and curl satisfy the specifications.
Space: None for all three guides
Curl: No. 3, 4 guides, less than 1mm. None for No. 5 guide.

## 2-5. Audio/CTL Position Adjustment

### 1) Audio Head Azimuth Adjustment

Refer to the section on "Audio Head (ACE ass'y) Azimuth Adjustment" in the Service Manual.

**Connection of Equipment:**

The connections of the equipment to the input/output terminals are shown in Fig. 2-22.

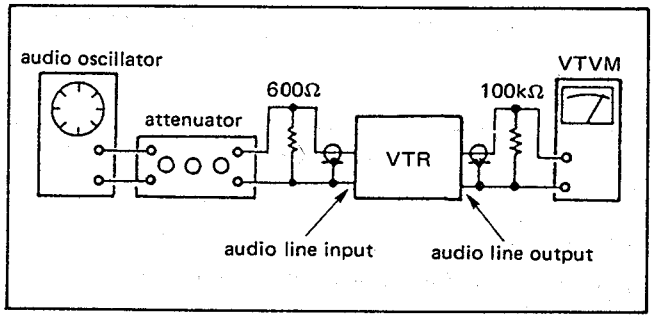



*Fig. 2-22 Connections*

(1) Terminate the audio line output terminal with a 100kΩ resistor and connect a VTVM.
(2) Play back the 5kHz signal segment of the alignment tape (KR5-2H).
(3) Adjust the azimuth adjustment screw on the audio head for a maximum VTVM reading. (See Fig. 2-22).

**Note:** Loosen azimuth adjustment screw before the adjustment and tighten it after the completion.

### 2) CTL Position Adjustment

Adjust ACE head position so that the RF output waveform is maximum when the tracking control knob at center click.
Refer to the section on "ACE Assembly Position Adjustment" in the Service Manual.

**Note:** Be sure to perform with tracking control knob at center click.

**Position Adjustment of ACE Assembly**

- This adjustment includes the mechanical head mounting position adjustment and the electrical tracking control center adjustment.
- The adjustment sequence is to perform the tracking control center adjustment and then the mechanical adjustment of the head mounting position. If this sequence is reversed, poor tracking occurs.

(1) Connect a dual-trace oscilloscope as follows.
CH-1 . . . . . RF OUT
CH-2 . . . . . AUDIO OUT
Ext trigger . . . . . SWITCHING PULSE OUT
(2) Play back (βII mode) the 1MHz segment of alignment tape KR5-2H (See Fig. 2-23).
(3) Set the tracking control to the center detent position and confirm that the output waveform level is maximum and the 0 level point of the audio signal appears at the Bch waveform point as shown in Fig. 2-23. If the specification is not satisfied, perform the following Step 4.

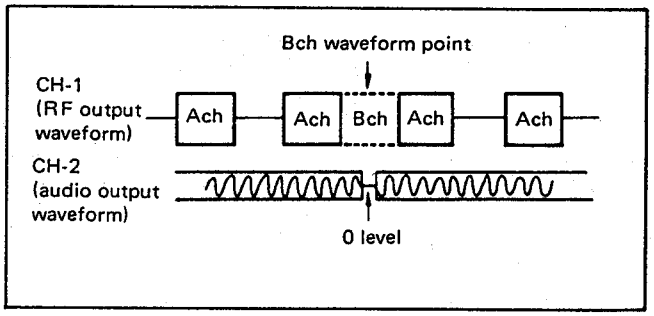



*Fig. 2-23 Position Adjustment of ACE Assembly (1)*

(4) Perform the tracking control center adjustment.
(5) Set the TRACKING control knob to its center detent point and play back the 1MHz segment of the alignment tape (KR5-2H).
(6) Loosen the two position adjusting screws of the ACE head and adjust the cut-out section of section A for maximum RF output waveform and a 0 level of audio signal at the Bch waveform point. (See Fig. 2-23.)

**Note:** Perform the adjustment so that the center of the cut-out section of the A section will almost match the center of the round hole.

(7) Play back the 1MHz segment of the alignment tape and confirm the proper picture appearance.
(8) Tighten the position adjusting screw of the ACE head.

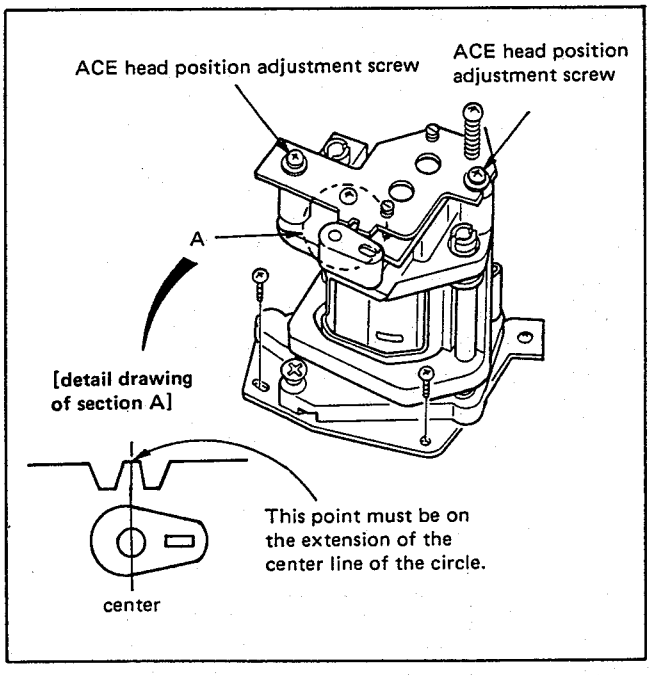

ACE head position adjustment screw
ACE head position adjustment screw
A
[detail drawing of section A]
This point must be on the extension of the center line of the circle.
center

*Fig. 2-24 Position Adjustment of ACE Assembly (2)*

If there is space at the bottom (Fig. 2-26 ② ), adjust by turning the height adjustment screw Ⓐ clockwise.
(Judge if there is space by pressing the parallel plate with a finger to see if there is play.)

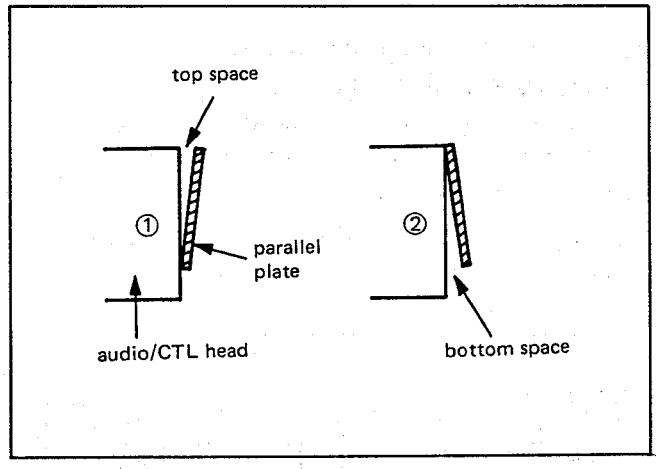



*Fig. 2-26*

## 2-6. Audio Height Adjustment

This adjustment is basically unnecessary, as it is preadjusted at the factory. The same applies to the repair ACE assembly. However, if the adjustment screw has been touched and it is absolutely necessary to adjust, perform the following procedure.

**Parallel Adjustment Relative to ACE Head Guide**

1) Place the parallel plate SL-0657 on No. 5 guide and audio/CTL head. (Fig. 2-25)

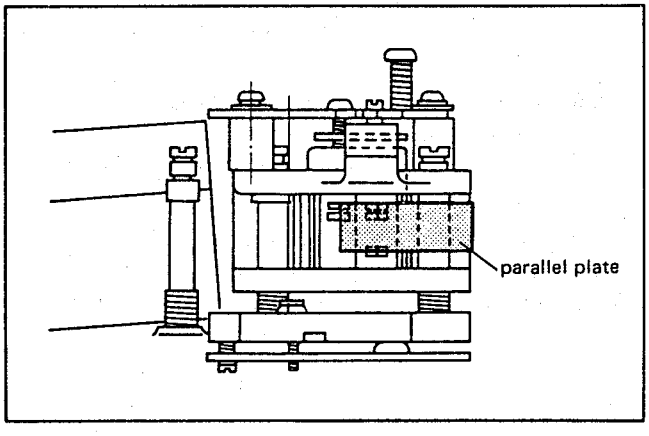



*Fig. 2-25*

2) With No. 5 guide as reference, confirm that there is no space between the audio/CTL head and the parallel plate. If there is space at the top (Fig. 2-26 ① ), adjust by turning the height adjustment screw Ⓐ counterclockwise. (Fig. 2-27)

3) Put KR5-2H into FWD.
4) Perform azimuth adjustment according to the Service Manual.
5) While observing the audio head with a dental mirror, match up the core upper edge and tape upper edge as in Fig. 2-28, with the two height adjustment screws and the azimuth adjustment screw.
Turn the two height adjustment screws in the same direction at the same angle, and the azimuth adjustment screw in the opposite direction at the same angle. Be sure to turn all three screws.

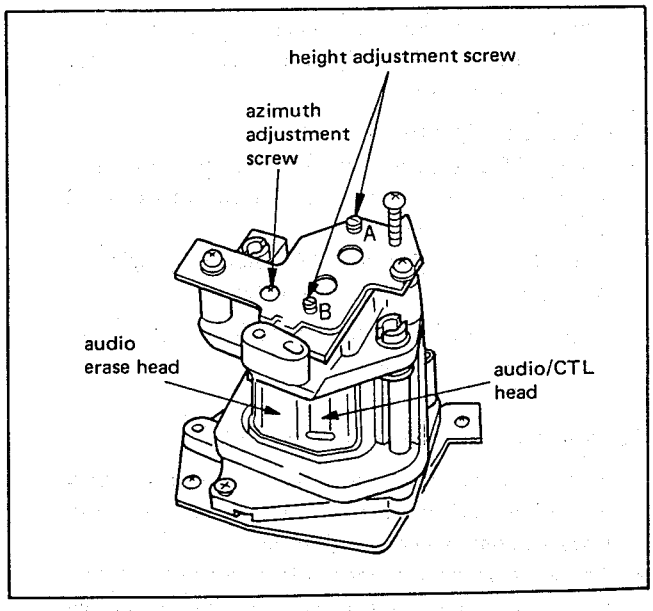



*Fig. 2-27*

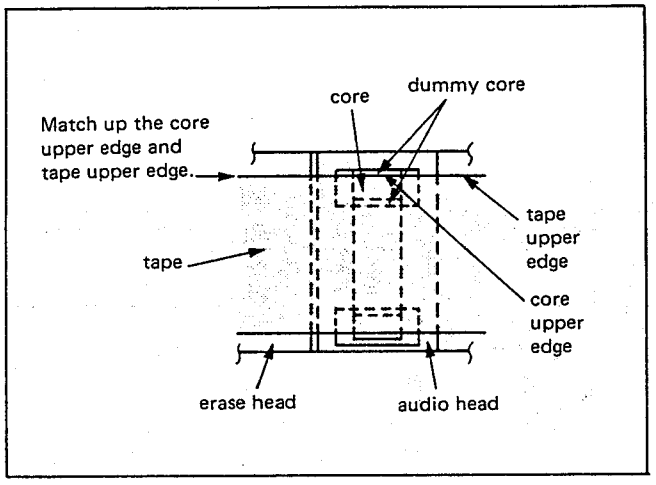



*Fig. 2-28*

6) From the position in 5), turn the two height adjustment screws clockwise 70° and turn the azimuth adjustment screw counterclockwise 70°. (This adjustment makes the tape upper edge 0.1mm above the core upper edge.)
The ACE head adjustment affects tape path, so it is necessary to perform exit side tape path adjustment and CTL position and azimuth check and adjustment.
Perform the exit side adjustment and audio/CTL position adjustment in the previous sections.

### 2-7. Self-Recorded RF Output Waveform Check

1) Set the tracking control knob to center click.
2) Record an on-the-air signal on an L-500 tape, rewind and play back.
3) Confirm that the RF output waveform satisfies the condition in Fig. 2-29. If not, readjust tape path.

$$① \frac{E\ min}{E\ max} \geqq 65\%$$

② at 80% interval, $\frac{E}{E\ max} \geqq 80\%$

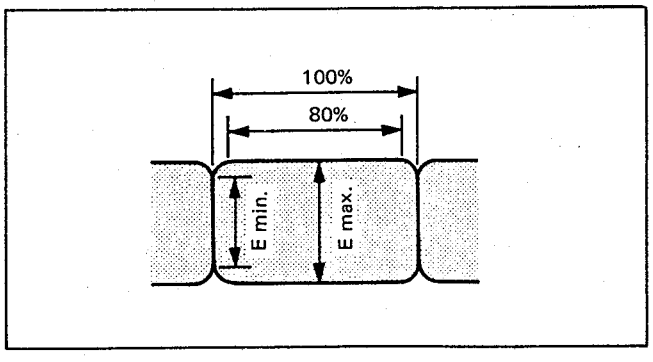



*Fig. 2-29*

### 2-8. Pairing Check

1) Set the tracking control knob to center click.
2) Record an on-the-air signal on an L-500 tape, rewind and play back.
3) Check CH-A, CH-B RF output levels.
4) Match up CH-A and CH-B RF output levels with RP board CH balance. (Fig. 2-30)

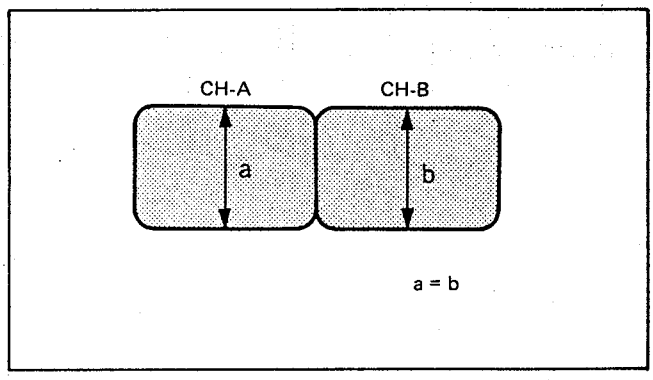



*Fig. 2-30*

5) Adjust oscilloscope V GAIN so that the RF output waveform on the oscilloscope is 5cm.
6) Turn the tracking control knob to the right, as seen from the front, and make the large output waveform 2cm. (Fig. 2-31)

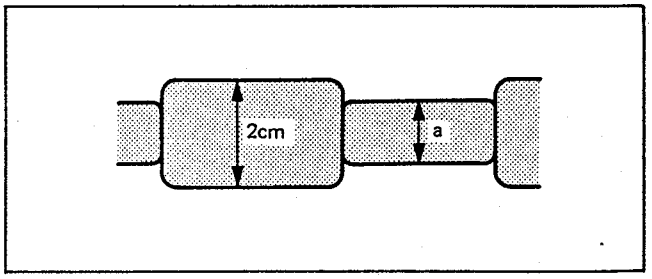
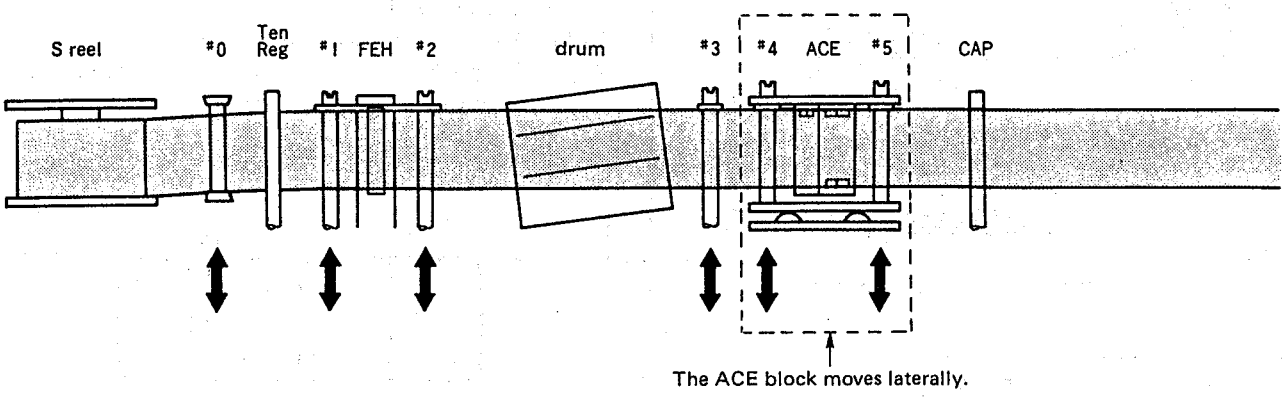



*Fig. 2-31*

7) At this time, check that the small output channel's output satisfies the specification.
Specification: small output CH 1.0 – 2.0cm (Fig. 2-31 a )
8) Return oscilloscope V GAIN to its original state, and return RF output level to the state in 3) with CH balance.

## 2-9. Tape Running Development Chart




The arrows show the directions of the movement.

*Fig. 2-32*

# SECTION 3

## 711 TYPE (NTSC SYSTEM)

This adjustment is performed so that the tape runs correctly in a set position, and has a large effect on picture quality and interchangeability. Perform the adjustment in the order given below.

### 3-1. Terminology

The No. 0 to 6 guides on the tape guide location diagram (Fig. 3-1) are called the entrance side guides, and No. 7 to 10 guides are the exit side guides. When the alignment tape (KR5-1M)is played, the side to the left of center of the RF output waveform on the oscilloscope is called the "entrance side", and the waveform is mainly affected by the entrance side guides. The right side is called the "exit side" and is mainly affected by the exit side guides. (Fig. 3-2)

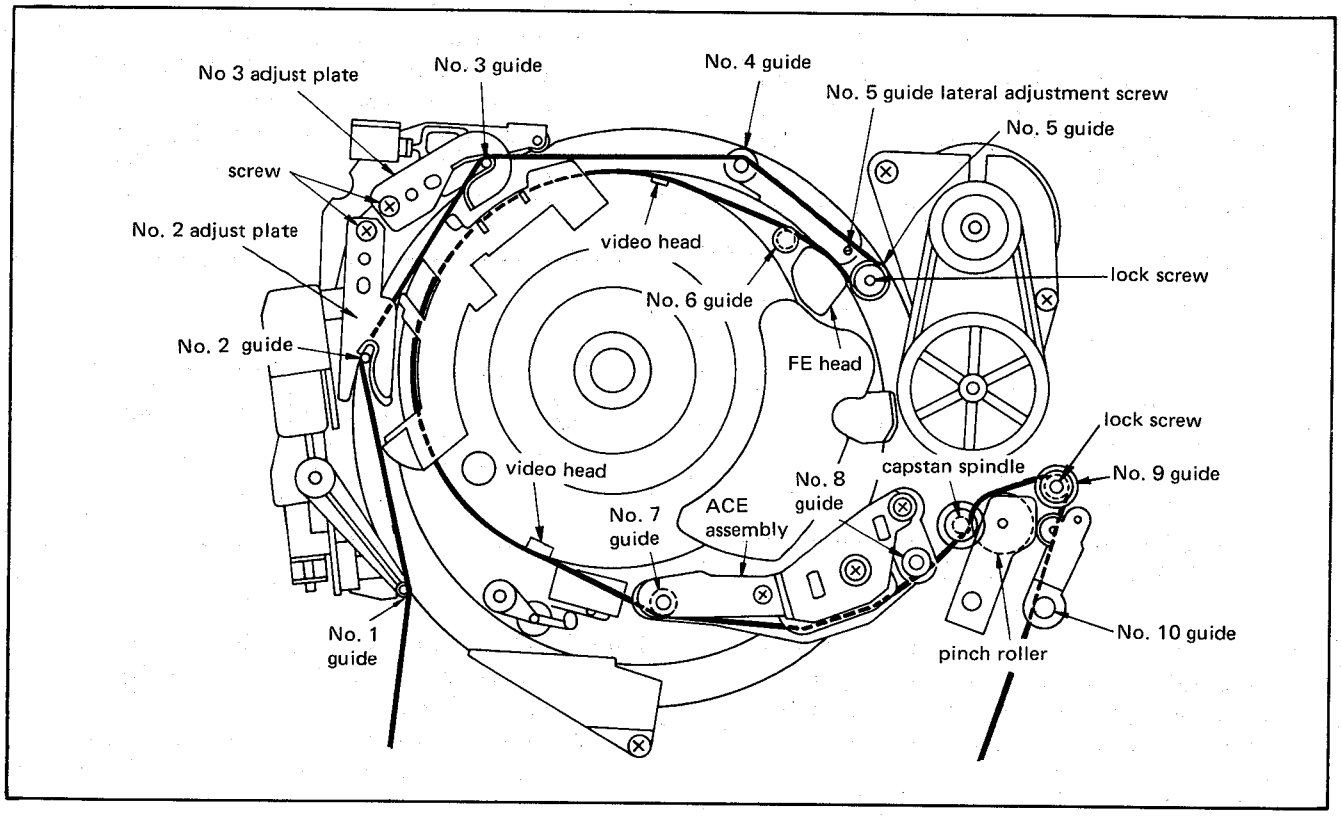



*Fig. 3-1 Tape Guide Location Diagram*

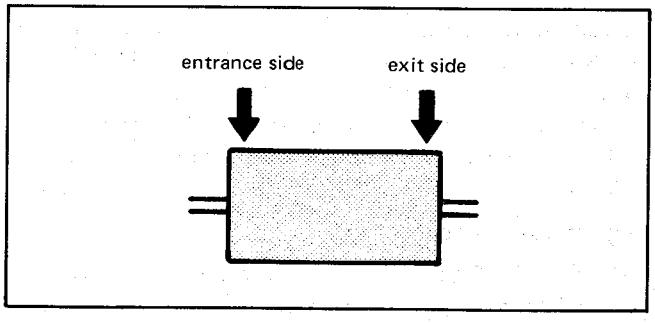



*Fig. 3-2 RF Output Waveform*

### 3-2. Preparations for Adjustment

1) Clean the tape running surfaces (tape guides, drum, capstan, pinch roller, ACE head, etc.) with a cleaning cloth dipped in methanol.
2) Remove the cassette lid of the alignment tape (KR5-1M) according to the instructions in the Service Manual.
3) Connect the oscilloscope to RF board RF output pin and the external trigger to the switching pulse pin.

8) Turn No. 5 guide lock screw clockwise to tighten.

**Note:** When the lock screw is tightened, the waveform changes easily, so be sure that the waveform is within the specifications after the screw is tightened. (Fig. 3-14) If not, adjust so that the entrance portion of the waveform is 4.2 – 4.5cm after tightening the lock screw.

9) Turn No. 6 guide clockwise and make the RF output waveform entrance portion 4cm. (Fig. 3-15)

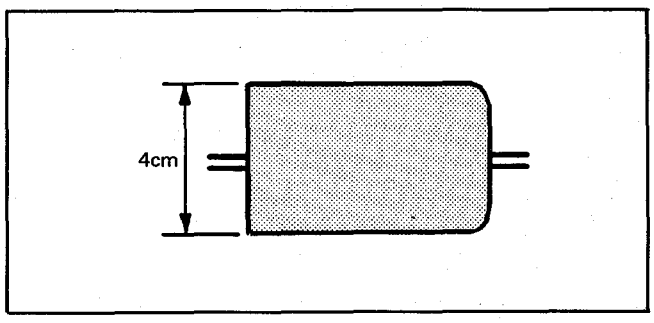



*Fig. 3-15*

10) Turn No. 4 guide clockwise while observing No. 5, No. 6 guide flange sections with a dental mirror, and check that curl and spaces are within the specifications. (Fig. 3-16)

Spec :

| Guide | Curl | Space |
|---|---|---|
| No. 5 | less than 1mm | none |
| No. 6 | less than 0.5mm | none |

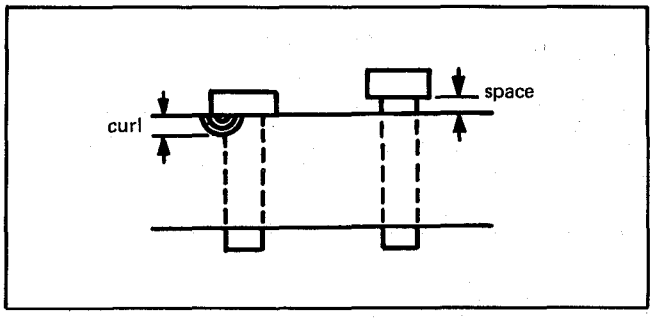



*Fig. 3-16*

11) Put into RVS mode, turn the tracking control knob, and check that there is no bound when the peak of the peak waveform is in the center of the synchroscope. (Fig. 3-17) If there is, readjust starting from 1).

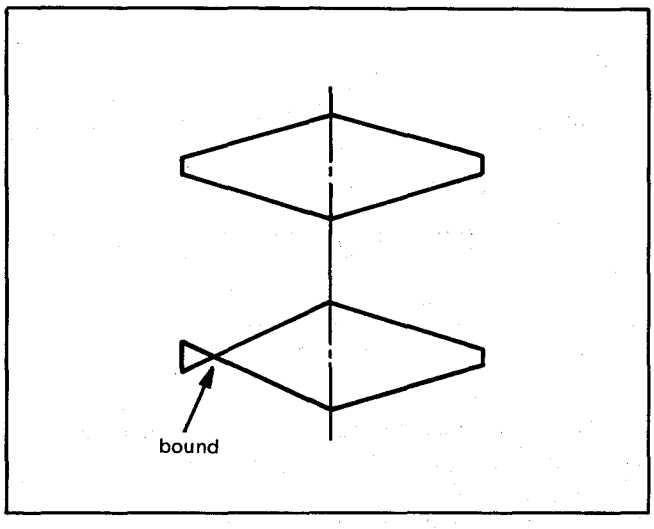



*Fig. 3-17 RVS waveform*

### 3-4. Exit Side Adjustment

1) Turn No. 7 and No. 8 guides counterclockwise and make a space between the tape and the flange. The RF waveform at this time is called the free waveform.

**Note:** The space should be about 0.3mm. (Fig. 3-18) Check that the tape does not touch the ACE head lower flange.

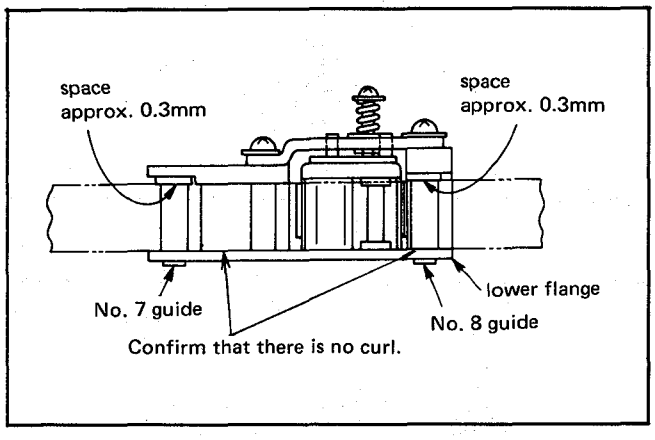



*Fig. 3-18*

2) Check that the free waveform is within the range shown in Fig. 3-19 ⓐ – ⓑ .

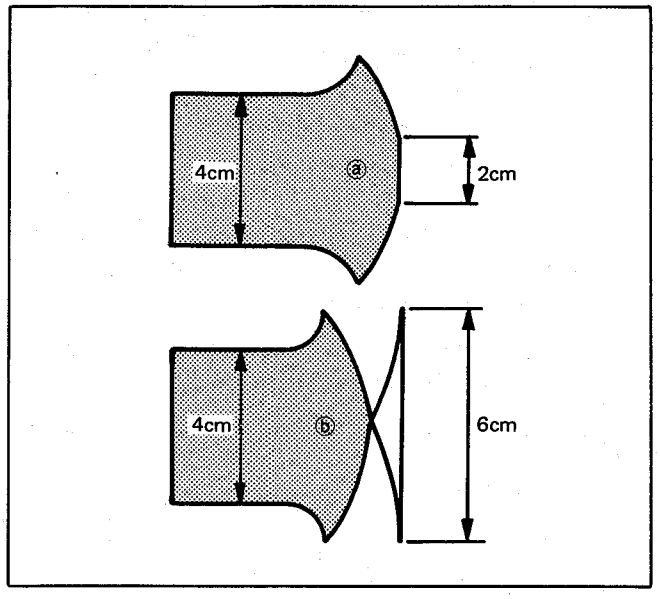



*Fig. 3-19 Free Waveform*

3) If the free waveform is not within the range in Fig. 3-19, perform the following adjustment.
   (1) When there are no (or few) peaks on the free waveform: Turn height adjustment screw ⓐ (Fig. 3-20) slowly clockwise to obtain the range in Fig. 3-19.
   (2) When there are too many peaks: Turn height adjustment screw ⓐ slowly counterclockwise.

**Note** 1): Turn screw ⓐ slowly and observe the waveform movement every 30°.
2): When screw ⓐ is turned, the tape running height changes, and the tape may touch the upper or lower guide flange. Therefore, when performing this adjustment, observe continuously with a dental mirror and make sure that the tape does not touch the No. 7, 8 guide flanges and ACE head lower flange. If the tape touches No. 7, 8 guides before the range in Fig. 3-19 is obtained, turn No. 7, 8 guides counterclockwise and make space. If it touches the ACE head lower flange, turn No. 7, 8 guides clockwise.

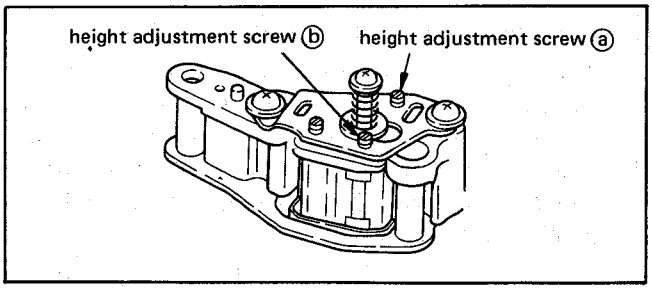



*Fig. 3-20*

4) Turn No. 7 guide clockwise and make the RF output waveform exit 4cm. (Fig. 3-21)

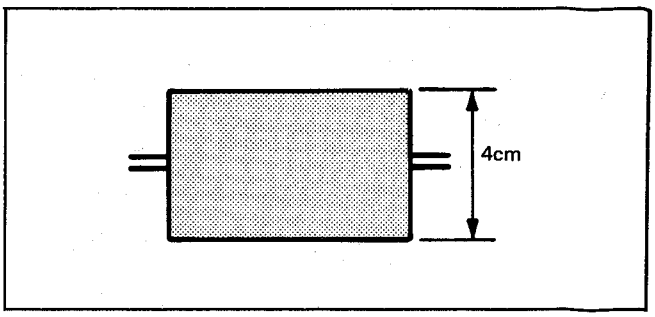



*Fig. 3-21 No. 7 Guide Waveform*

5) While observing the No. 8 guide and tape space with a dental mirror, turn the No. 8 guide clockwise, and get rid of the space. (This can be done more easily by turning until a curl appears, then turning in the opposite direction just until the curl is gone.)
6) Check that the RF output waveform exit portion is 4cm. If it has changed, make it 4cm with No. 7 guide. If No. 8 guide is tightened, the RF waveform changes and goes over 4cm, so turn No. 7 guide again and make it 4cm.
7) Check again that there is no space between No. 8 guide and the tape.
8) Loosen No. 9 guide lock screw. (Fig. 3-22)

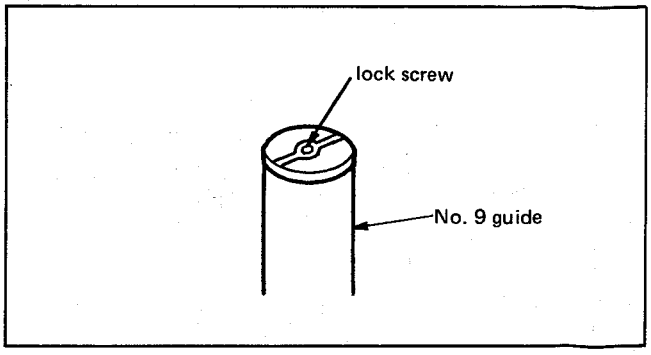



*Fig. 3-22*

9) Put into RVS mode and check No. 8 guide curl and space with a dental mirror.
10) When there is curl at No. 8 guide in RVS mode, turn No. 9 guide clockwise and adjust so that the curl disappears. When there is space, turn the No. 9 guide counterclockwise and adjust so that space is gone.
11) Check that there is no curl at No. 8 guide in REV mode.
12) If there is curl at No. 8 guide in REV mode, turn No. 9 guide clockwise to get rid of the curl. If put into RVS mode at this time, there will be space, but this is OK.

13) When there is no more curl or space at No. 8 guide, tighten No. 9 guide lock screw.
14) In RVS mode again, check that there is no curl or space at No. 8 guide.

Spec:

| Guide | Curl | Space |
|---|---|---|
| No. 7 | less than 1mm | none |
| No. 8 | none | none |

If there is space, turn the guide clockwise to correct. For curl, readjust again from 1).

### 3-5. S Reel Damage Check

1) Play back the tape and portion of L-830 tape in RVS mode (or REV mode for models without RVS mode), and check that there is no tape curl at the S reel flange.
2) For curl at the S reel upper flange:
(Fig. 3-23 ⓐ ) Loosen the No. 2 adjust plate screw, move the plate in the direction of arrow ⓐ in Fig. 3-24 and tighten the screw.
For tape curl at the lower flange:
(Fig. 3-23 ⓑ ) Loosen the No. 2 adjust plate screw, move the plate in the direction of arrow ⓑ in Fig. 3-24 and tighten the screw.
Perform S reel damage check again and repeat until there is no tape curl (tape damage) at the upper and lower flanges.

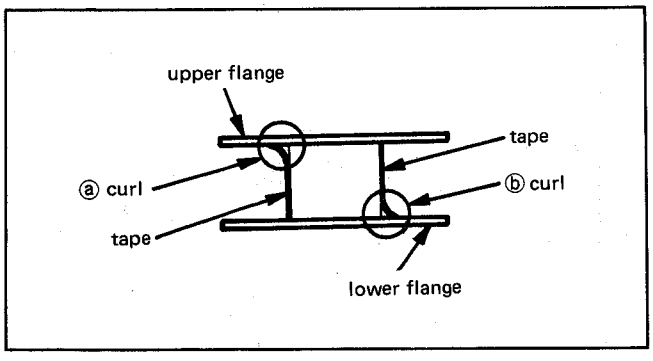



*Fig. 3-23 S Reel*

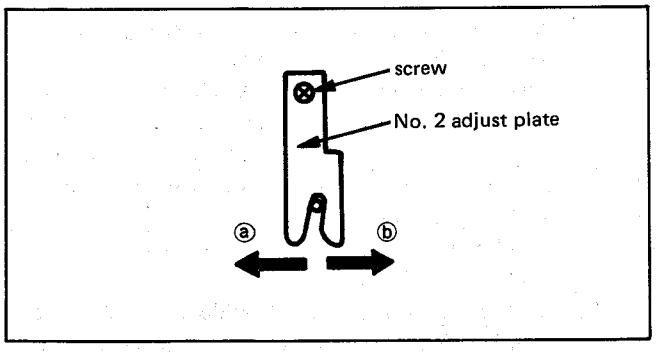



*Fig. 3-24*

**Note:** The No. 2 guide positioning requires care; move it gradually about 0.1mm at a time.

### 3-6. Audio/CTL Position Adjustment

#### 1) Audio Head Azimuth Adjustment

Refer to the section on "Audio Head (ACE ass'y) Azimuth Adjustment" in the Service Manual.

**Connection of Equipment:**

The connections of the equipment to the input/output terminals are shown in Fig. 3-25.

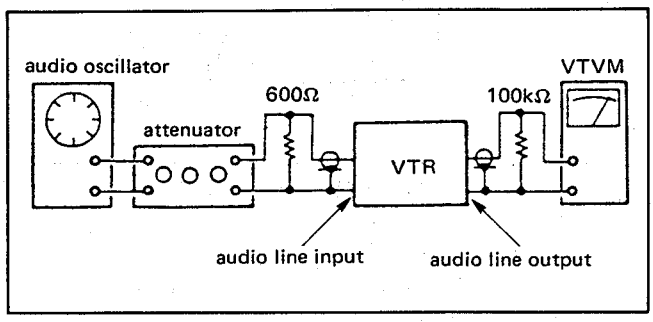



*Fig. 3-25 Connections*

(1) Terminate the audio line output terminal with a 100kΩ resistor and connect a VTVM.
(2) Play back the 5kHz signal segment of the alignment tape (KR5-1M).
(3) Adjust the azimuth adjustment screw on the audio head for a maximum VTVM reading. (See Fig. 3-25)

**Note:** Loosen azimuth adjustment screw before the adjustment and tighten it after the completion.

#### 2) CTL Position Adjustment

Adjust ACE head position so that the RF output waveform is maximum when the tracking control knob is at center click.
Refer to the section on "ACE Assembly Position Adjustment" in the Service Manual.

**Note:** Be sure to perform with tracking control knob at center click.

**CTL Head (ACE Assembly) Position Adjustment**

This adjustment is both mechanical and electric: mechanically, it is the adjustment of the CTL head position, and electrically, it is the tracking control center adjustment. The procedure involves performing the electrical adjustment first, then the head position adjustment.

(1) Connect the oscilloscope as follows:
1ch. . . . . .RF out
2ch. . . . . .AUDIO out
external trigger . . . . . SWITCHING PULSE out
(2) Replay the tracking portion of the alignment tape (KR5-1M).
(3) Turn the tracking control knob back and forth, and confirm that the output waveform level is maximum at the center click position, and that the 0 level of the audio signal is at the point where the RF output waveform Bch waveform appears, as shown in Fig. 3-26. If adjustment is necessary, proceed as follows.

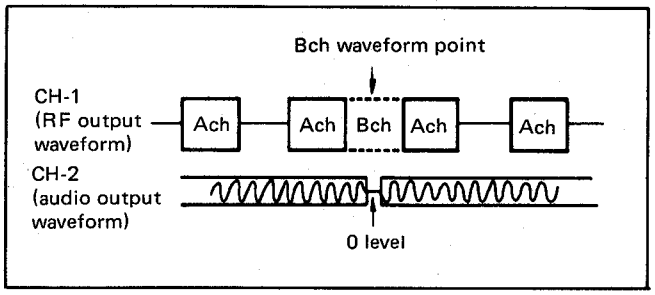



*Fig. 3-26*

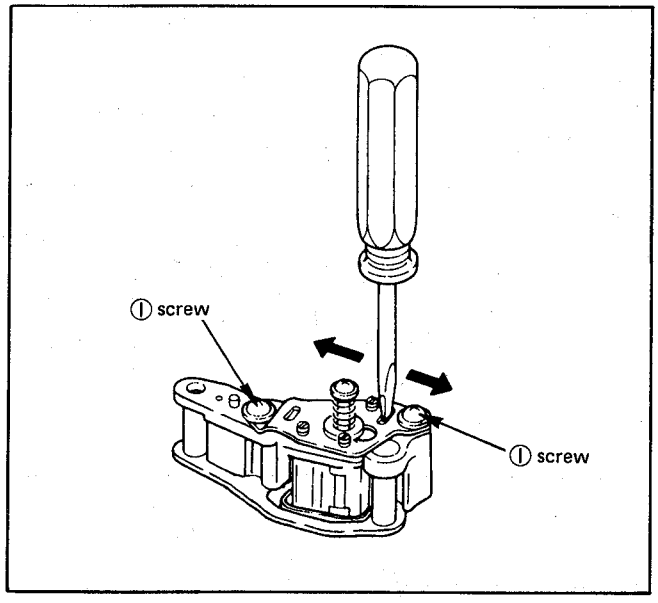



*Fig. 3-27*

(4) Tracking Control Center Adjustment
(5) CTL Head Position Adjustment
Set the tracking control knob at the center click position and loosen the two ACE assembly position adjustment screws ①. As shown in Fig. 3-27, slide the ACE assembly with a screwdriver until it is in the position shown in Fig. 3-26 and the RF output waveform is maximum. Tighten the screws when this position is obtained.
(6) Replay the color bars of the alignment tape and check the picture quality.

### 3-7. Audio Height Adjustment

This adjustment is basically unnecessary, as it is preadjusted at the factory. The same applies to the repair ACE assembly. However, if the adjustment screw has been touched and it is absolutely necessary to adjust, perform the following procedure.

**Parallel Adjustment Relative to ACE Head Guide**

1) Place the parallel plate SL-0657 on No. 5 guide and audio/CTL head. (Fig. 3-28)

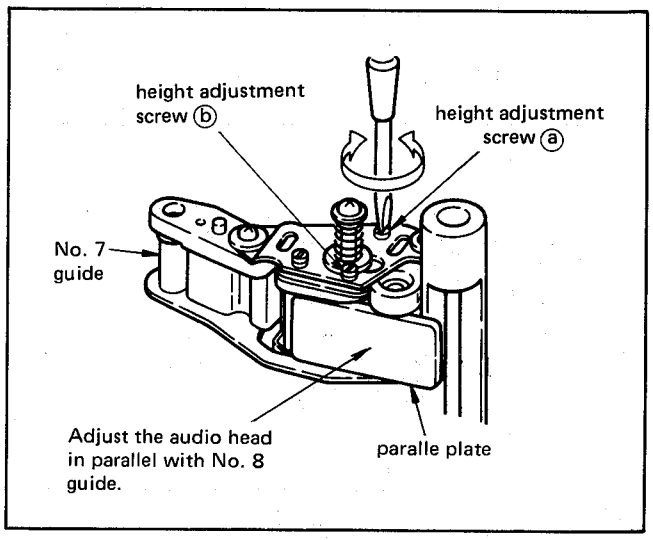



*Fig. 3-28*

2) With No. 5 guide as reference, confirm that there is no space between the audio/CTL head and the parallel plate.
If there is space at the top (Fig. 3-29 ① ), adjust by turning the height adjustment screw ⓐ counterclockwise. (Fig. 3-28)
If there is space at the bottom (Fig. 3-29 ② ), adjust by turning the height adjustment screw ⓐ clockwise.
(Judge if there is space by pressing the parallel plate with a finger to see if there is play.)

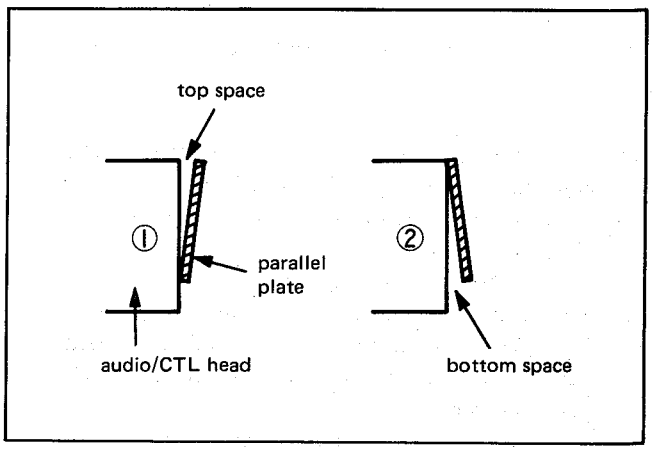



*Fig. 3-29*

3) Put KR5-1M into FWD.
4) Perform azimuth adjustment according to the Service Manual.
5) While observing the audio head (Fig. 3-30) with a dental mirror, match up the core upper edge and tape upper edge as in Fig. 3-31, with the two height adjustment screws and the azimuth adjustment screw.
Turn the two height adjustment screws in the same direction at the same angle, and the azimuth adjustment screw in the opposite direction at the same angle. Be sure to turn all three screws.

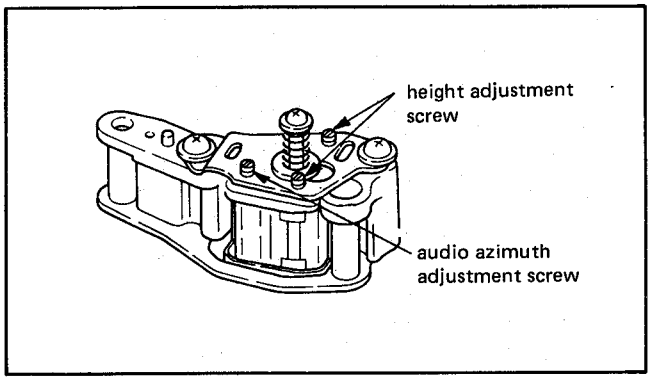



*Fig. 3-30*

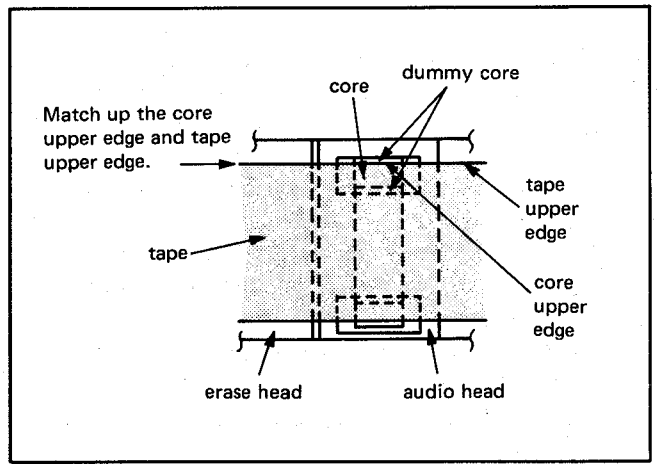



*Fig. 3-31*

6) From the position in 5), turn the two height adjustment screws clockwise 70° and turn the azimuth adjustment screw counterclockwise 70°. (This adjustment makes the tape upper edge 0.1mm above the core upper edge.)
The ACE head adjustment affects tape path, so it is necessary to perform exit side tape path adjustment and CTL position and azimuth check and adjustment.
Perform the exit side adjustment and audio/CTL position adjustment in the previous sections.

### 3-8. Self-Recorded RF Output Waveform Check

1) Set the tracking control knob to center click.
2) Record an on-the-air signal on an L-500 tape, rewind and play back.
3) Confirm that the RF output waveform satisfies the conditions in Fig. 3-32. If not, readjust tape path.

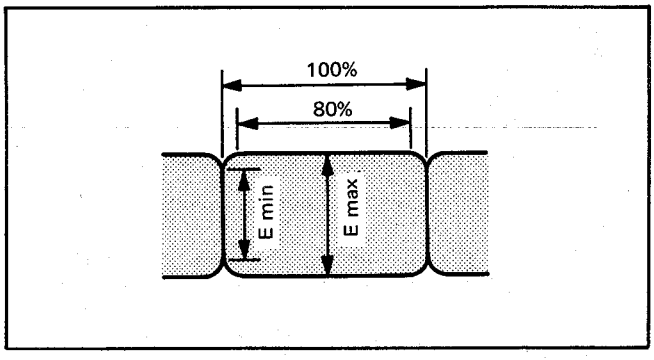



*Fig. 3-32*

### 3-9. Pairing Check

1) Set the tracking control knob to center click.
2) Record an on-the-air signal on an L-500 tape, rewind and play back.
3) Check CH-A, CH-B RF output levels.
4) Match up CH-A and CH-B RF output levels with RP board CH balance (Fig. 3-33)

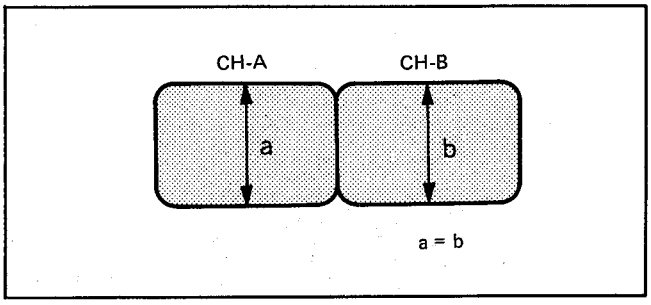



*Fig. 3-33*

5) Adjust oscilloscope V GAIN so that the RF output waveform on the oscilloscope is 5cm.
6) Turn the tracking control knob to the right, as seen from the front, and make the large output waveform 2cm. (Fig. 3-34)

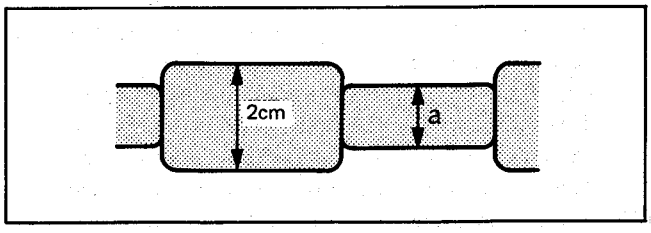
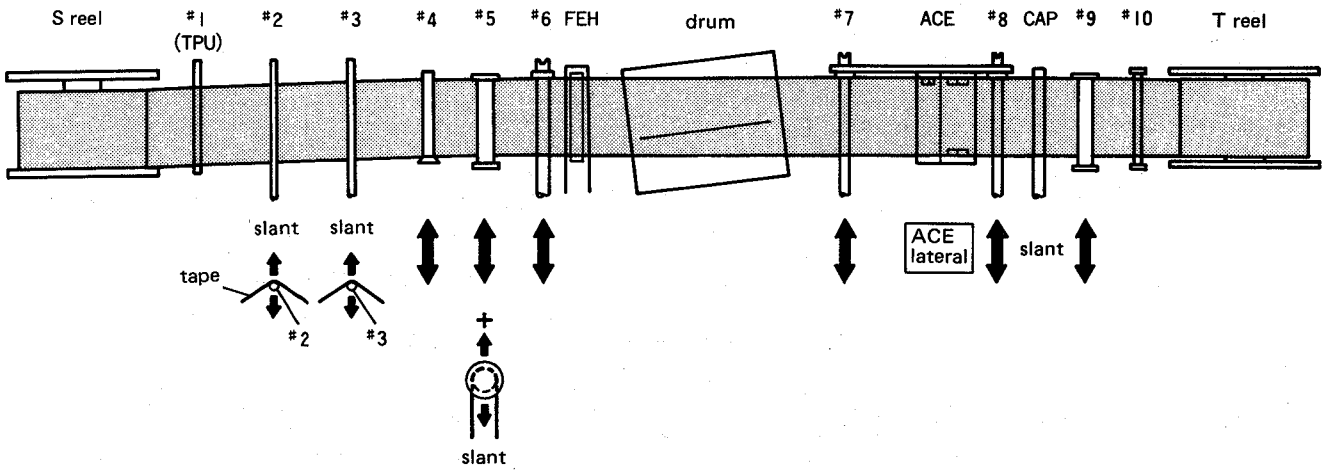



*Fig. 3-34*

7) At this time, check that the small output channel's output satisfies the specification. Specification: small output CH 1.0 – 2.0cm (Fig. 3-34 ⓐ )
8) Return oscilloscope V GAIN to its original state, and return RF output level to the state in 3) with CH balance.

### 3-10. Tape Running Development Chart




The arrows show the directions of the movement.

*Fig. 3-35*

# SECTION 4

## 711 TYPE (CCIR SYSTEM)

This adjustment is performed so that the tape runs correctly in a set position, and has a large effect on picture quality and interchangeability. Perform the adjustment in the order given below.

### 4-1. Terminology

The No. 0 to 6 guides on the tape guide location diagram (Fig. 4-1) are called the entrance side guides, and No. 7 to 10 guides are the exit side guides. When the alignment tape (KR5-2H) is played, the side to the left of center of the RF output waveform on the oscilloscope is called the "entrance side", and the waveform is mainly affected by the entrance side guides. The right side is called the "exit side" and is mainly affected by the exit side guides. (Fig. 4-2)

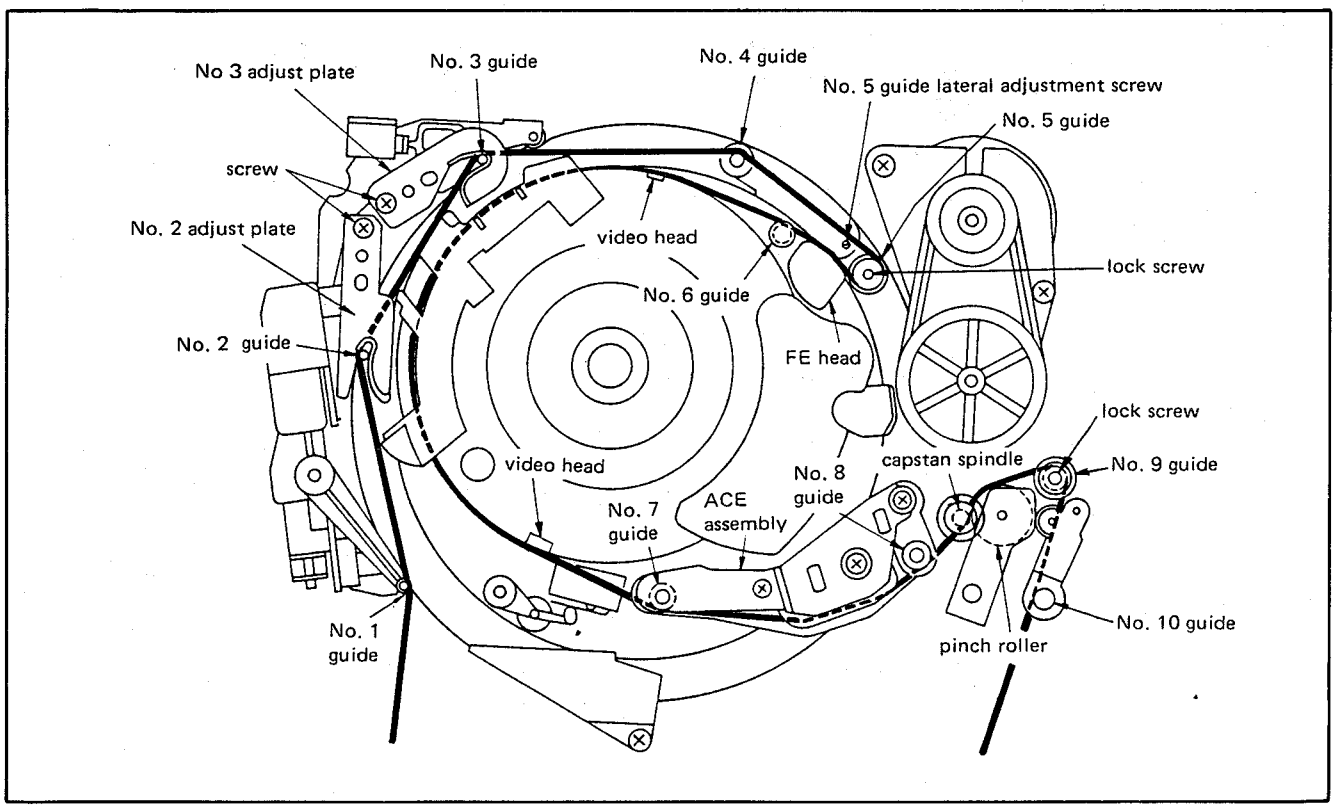



*Fig. 4-1 Tape Guide Location Diagram*

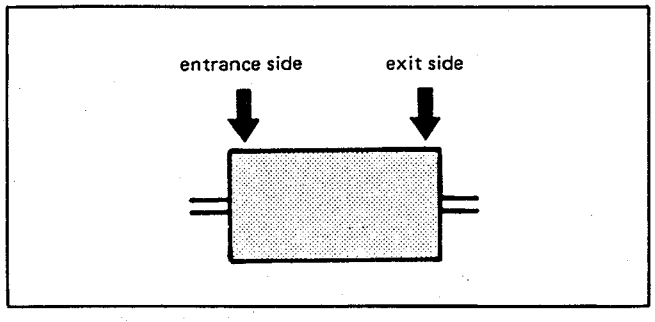



*Fig. 4-2 RF Output Waveform*

### 4-2. Preparations for Adjustment

1) Clean the tape running surfaces (tape guides, drum, capstan, pinch roller, ACE head, etc.) with a cleaning cloth dipped in methanol.
2) Remove the cassette lid of the alignment tape (KR5-2H) according to the instructions in the Service Manual.
3) Connect the oscilloscope to RF board RF output pin and the external trigger to the switching pulse pin.

4) Play back the tracking portion of the alignment tape (KR5-2H).
5) Turn the tracking control knob to the position where the oscilloscope RF output waveform center portion is maximum.
6) Adjust oscilloscope V GAIN so that the RF output waveform center portion is 6cm on the oscilloscope. (Fig. 4-3)

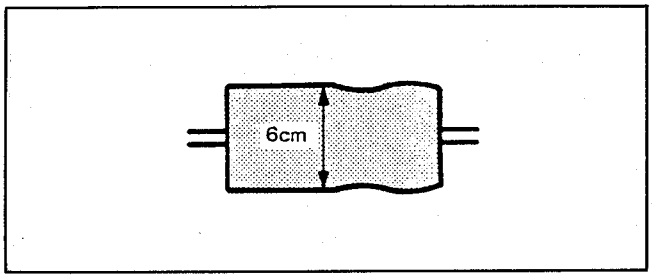



*Fig. 4-3*

7) Return the tracking control knob to center click and confirm that the RF output waveform is more than 5cm. (Fig. 4-4) When it is less than 5cm, refer to the section on CTL position adjustment and perform coarse adjustment.

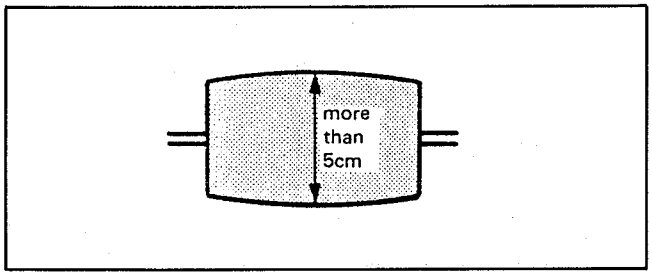



*Fig. 4-4 Center Click Waveform*

8) Adjust the tracking control knob so that the center of the RF output waveform is 4cm on the oscilloscope. (Fig. 4-5) Check the turning direction of the knob as explained below.

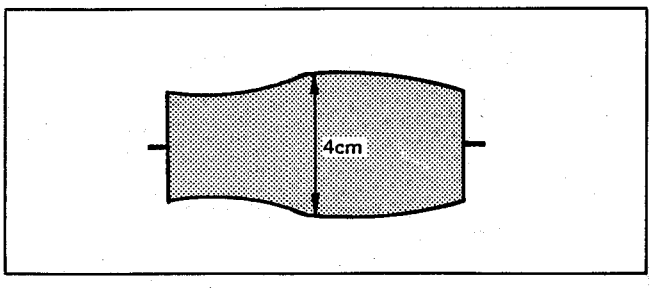



*Fig. 4-5*

(1) Turn the knob in either the clockwise or counterclockwise direction to make the waveform 4cm. (Fig. 4-6)

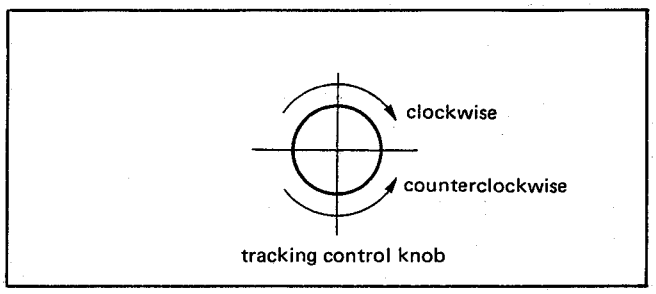



*Fig. 4-6 Counterclockwise*

(2) Turn the No. 6 guide clockwise.
(3) If the entrance portion of the waveform is as shown in Fig. 4-7 ⓐ and output is small, the direction that the tracking control knob is turned is correct.
If output is large as in Fig. 4-7 ⓑ , the opposite direction is correct. (The direction varies depending on the model.)
The waveform of 4cm produced by turning the tracking control knob is called the "2/3 waveform". The following are all performed using the 2/3 waveform unless otherwise indicated.

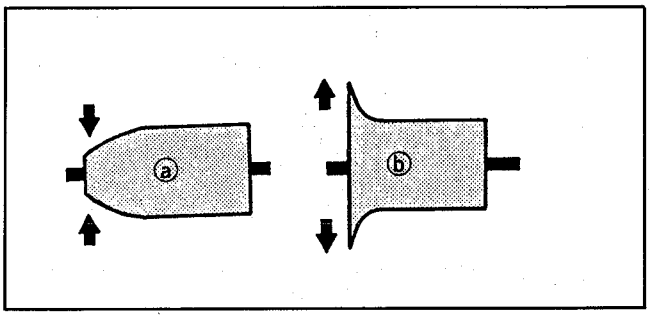



*Fig. 4-7*

**Note** 1): Correct tape path adjustment cannot be done without this 2/3 waveform. Be sure to adjust using this waveform.
2): The adjustment guides have screw lock applied to secure them, so remove the screw lock with alcohol first.

### 4-3. Entrance Side Adjustment

The adjustment locations are No. 3, 4, 5 and 6 guides. No. 3 guide is for lateral adjustment, No. 4 guide for lower flange tape pressure adjustment, No. 5 for lateral and upper flange tape pressure adjustment, and No. 6 guide is for upper flange tape pressure adjustment.

**Adjustment Procedure:**

1) Turn No. 6 guide upper flange counterclockwise and make a space between the upper flange and the tape. (Fig. 4-8, more than 0.5mm)

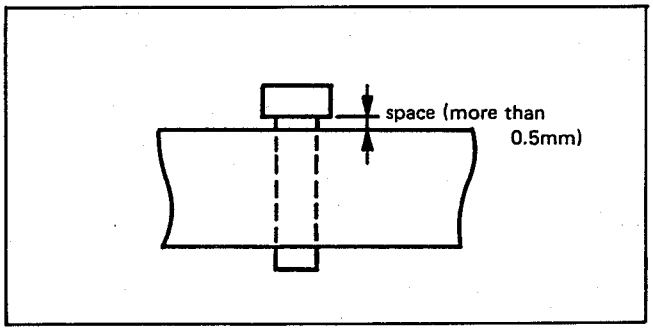



*Fig. 4-8*

2) Turn No. 4 guide fully clockwise until it touches.
3) Turn No. 4 guide 360° counterclockwise from the position in 2).
4) Turn No. 5 guide lateral screw (Fig. 4-9) counterclockwise and make slack at the upper portion of the tape. (Fig. 4-10) Next turn the screw clockwise and fix at the position where slack disappears. (Fig. 4-11)

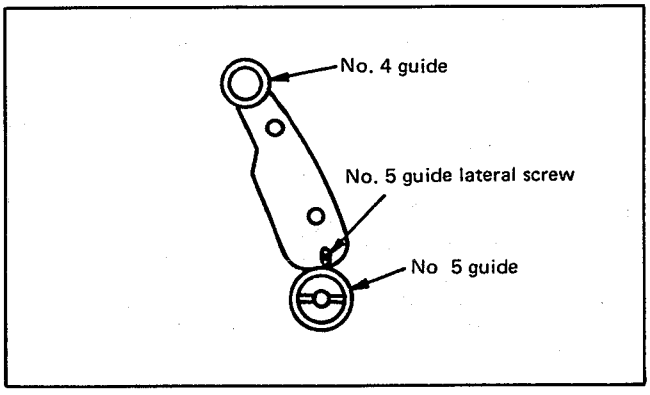



*Fig. 4-9*

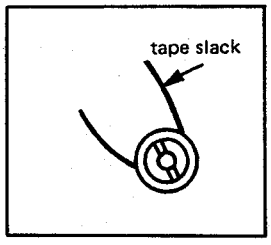



*Fig. 4-10*

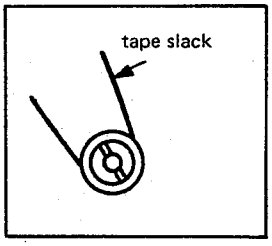



*Fig. 4-11*

**Note:** Tape slack: When the tape winds around the guides when running, if the guide slants, the tension at the upper and lower portions of the tape differs, and the portion with less tension develops tape slack.

5) Adjust No. 3 guide slant so that the slack of the tape winding around No. 4 guide is the same at the top and bottom. When the upper slack of the tape near No. 4 guide is larger, loosen the screw in Fig. 4-12 and move the No. 3 adjust plate in the direction of arrow (a). When the bottom slack is larger, move it in the direction of arrow (b). Then tighten the adjustment screw.

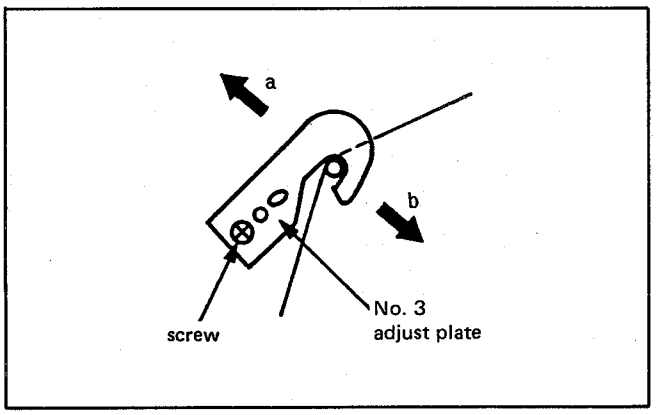



*Fig. 4-12*

6) Turn No. 5 guide lock screw counterclockwise to loosen. (Fig. 4-13)

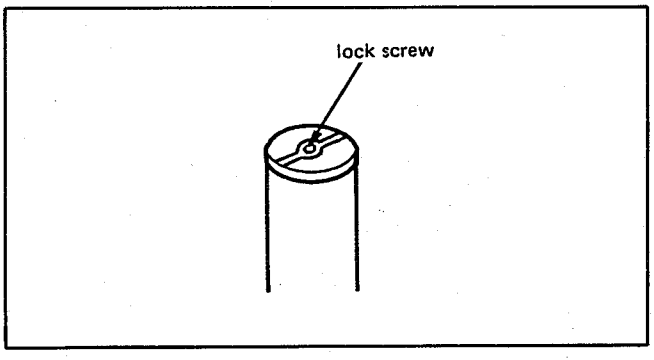



*Fig. 4-13*

7) Turn No. 5 guide flange so that RF output waveform entrance portion is 4.2 – 4.5cm. (Fig. 4-14)

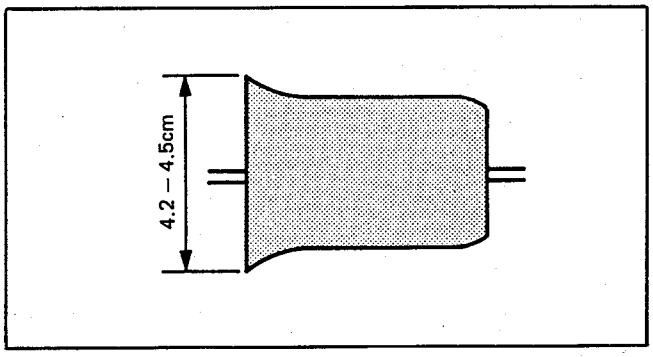



*Fig. 4-14*

8) Turn No. 5 guide lock screw clockwise to tighten.

**Note:** When the lock screw is tightened, the waveform changes easily, so be sure that the waveform is within the specifications after the screw is tightened. (Fig. 4-14) If not, adjust so that the entrance portion of the waveform is 4.2 – 4.5cm after tightening the lock screw.

9) Turn No. 6 guide clockwise and make the RF output waveform entrance porition 4cm. (Fig. 4-15)

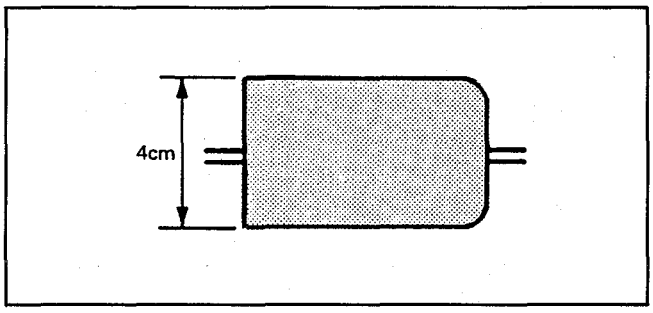



*Fig. 4-15*

10) Turn No. 4 guide clockwise while observing No. 5, No. 6 guide flange sections with a dental mirror, and check that curl and spaces are within the specifications. (Fig. 4-16)

Spec:

| Guide | Curl | Space |
|---|---|---|
| No. 5 | less than 1mm | none |
| No. 6 | less than 0.5mm | none |

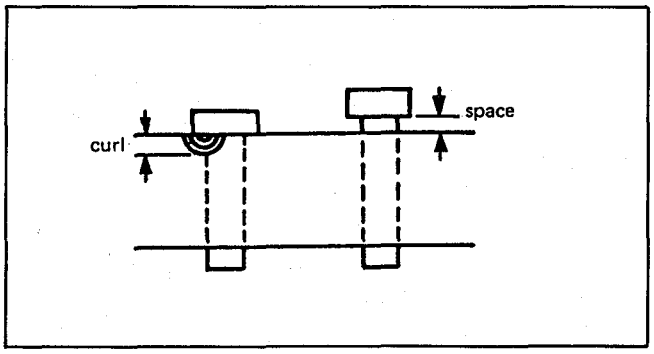



*Fig. 4-16*

11) Put into RVS mode, turn the tracking control knob, and check that there is no bound when the peak of the peak waveform is in the center of the synchroscope. (Fig. 4-17) If there is, readjust starting from 1).

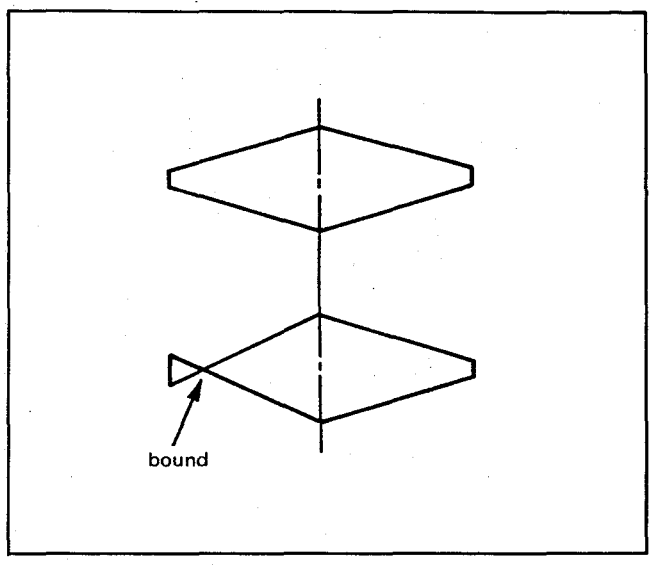



*Fig. 4-17 RVS Waveform*

### 4-4. Exit Side Adjustment

1) Turn No. 7 and No. 8 guides counterclockwise and make a space between the tape and the flange. The RF waveform at this time is called the free waveform.

**Note:** The space should be about 0.3mm. (Fig. 4-18) Check that the tape does not touch the ACE head lower flange.

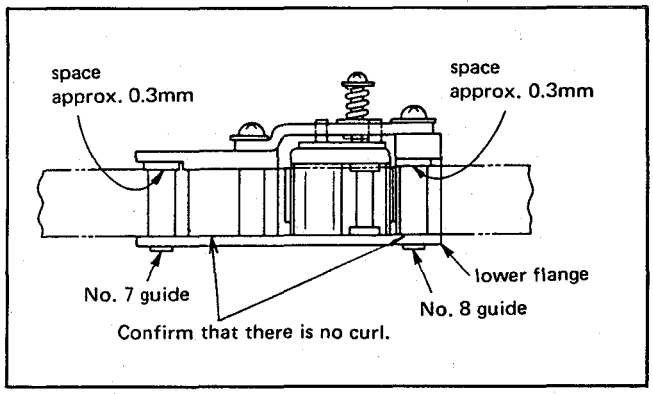



*Fig. 4-18*

2) Check that the free waveform is within the range shown in Fig. 4-19 ⓐ – ⓑ .

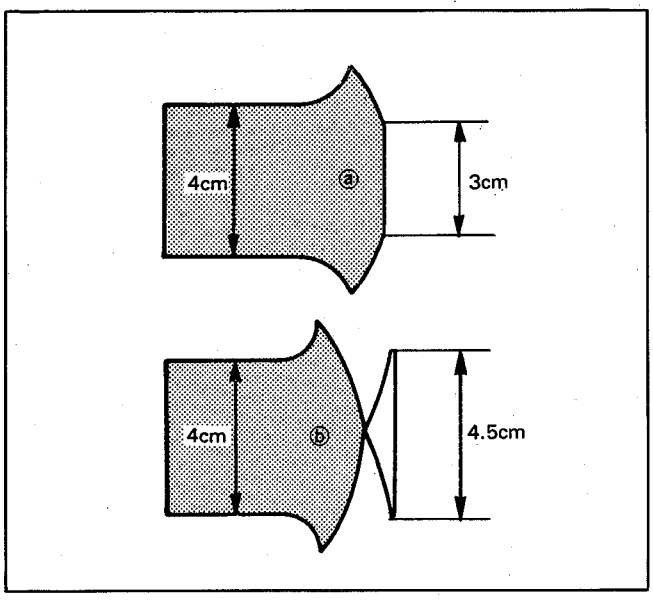



*Fig. 4-19 Free Waveform*

3) If the free waveform is not within the range in Fig. 4-19, perform the following adjustment.
   (1) When there are no (or few) peaks on the free waveform:
   Turn height adjustment screw ⓐ (Fig. 4-20) slowly clockwise to obtain the range in Fig. 4-19.
   (2) When there are too many peaks:
   Turn height adjustment screw ⓐ slowly counterclockwise.

**Note** 1): Turn screw ⓐ slowly and observe the waveform movement every 30°.
2): When screw ⓐ is turned, the tape running height changes, and the tape may touch the upper or lower guide flange. Therefore, when performing this adjustment, observe continuously with a dental mirror and make sure that the tape does not touch the No. 7, 8 guide flanges and ACE head lower flange. If the tape touches No. 7, 8 guides before the range in Fig. 4-19 is obtained, turn No. 7, 8 guides counterclockwise and make space. If it touches the ACE head lower flange, turn No. 7, 8 guides clockwise.

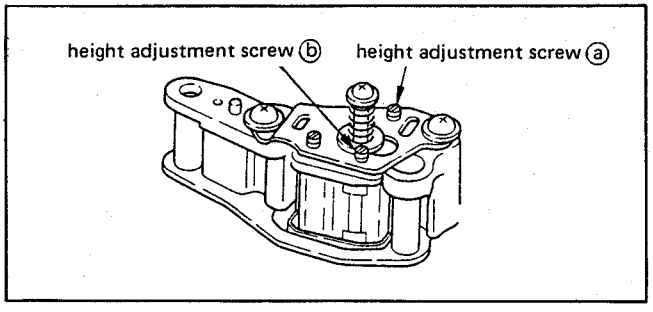



*Fig. 4-20*

4) Turn No. 7 guide clockwise and make the RF output waveform exit 4cm. (Fig. 4-21)

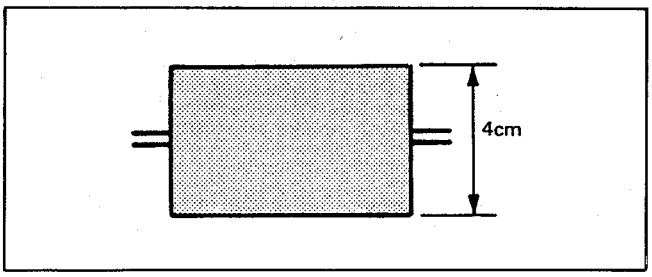



*Fig. 4-21 No. 7 Guide Waveform*

5) While observing the No. 8 guide and tape space with a dental mirror, turn the No. 8 guide clockwise, and get rid of the space. (This can be done more easily by turning until a curl appears, then turning in the opposite direction just until the curl is gone.)
6) Check that the RF output waveform exit portion is 4cm. If it has changed, make it 4cm with No. 7 guide. If No. 8 guide is tightened, the RF waveform changes and goes over 4cm, so turn No. 7 guide again and make it 4cm.
7) Check again that there is no space between No. 8 guide and the tape.
8) Loosen No. 9 guide lock screw. (Fig. 4-22)

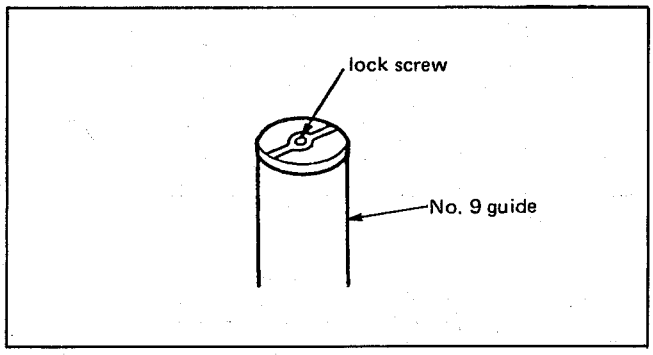



*Fig. 4-22*

9) Put into RVS mode and check No. 8 guide curl and space with a dental mirror.
10) When there is curl at No. 8 guide in RVS mode, turn No. 9 guide clockwise and adjust so that the curl disappears. When there is space, turn the No. 9 guide counterclockwise and adjust so that space is gone.
11) Check that there is no curl at No. 8 guide in REV mode.
12) If there is curl at No. 8 guide in REV mode, turn No. 9 guide clockwise to get rid of the curl. If put into RVS mode at this time, there will be space, but this is OK.

13) When there is no more curl or space at No. 8 guide, tighten No. 9 guide lock screw.
14) In RVS mode again, check that there is no curl or space at No. 8 guide.

Spec:

| Guide | Curl | Space |
|---|---|---|
| No. 7 | less than 1mm | none |
| No. 8 | none | none |

If there is space, turn the guide clockwise to correct. For curl, readjust again from 1).

### 4-5. S Reel Damage Check

1) Play back the tape end portion of L-830 tape in RVS mode (or REV mode for models without RVS mode), and check that there is no tape curl at the S reel flange.
2) For curl at the S reel upper flange:
(Fig. 4-23 ⓐ ) Loosen the No. 2 adjust plate screw, move the plate in the direction of arrow ⓐ in Fig. 4-24 and tighten the screw.
For tape curl at the lower flange:
(Fig. 4-23 ⓑ ) Loosen the No. 2 adjust plate screw, move the plate in the direction of arrow ⓑ in Fig. 4-24 and tighten the screw.
Perform S reel damage check again and repeat until there is no tape curl (tape damage) at the upper and lower flanges.

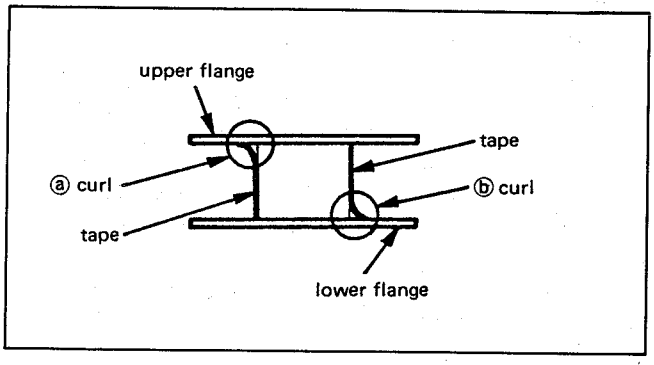



*Fig. 4-23 S Reel*

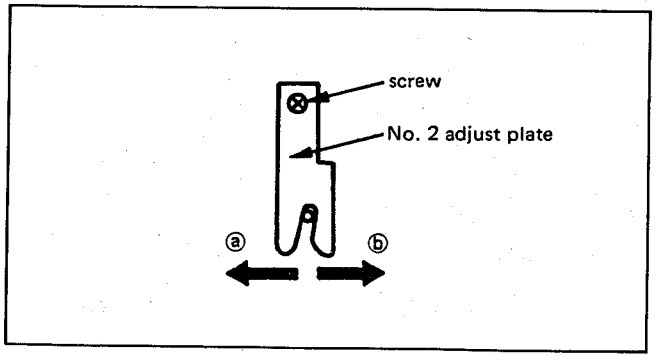



*Fig. 4-24*

**Note:** The No. 2 guide positioning requires care; move it gradually about 0.1mm at a time.

### 4-6. Audio/CTL Position Adjustment

#### 1) Audio Head Azimuth Adjustment

Refer to the section on "Audio Head (ACE ass'y) Azimuth Adjustment" in the Service Manual.

**Connection of Equipment:**

The connections of the equipment to the input/output terminals are shown in Fig. 4-25.

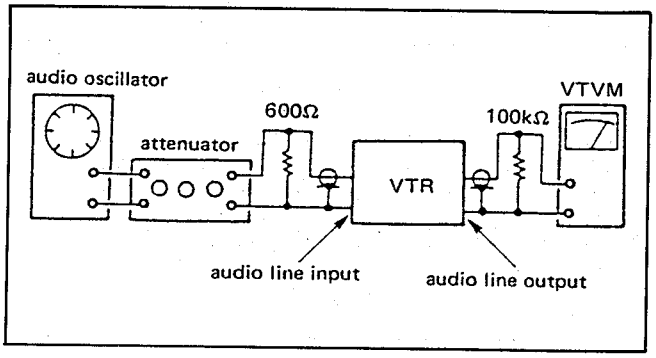



*Fig. 4-25 Connections*

(1) Terminate the audio line output terminal with a 100kΩ resistor and connect a VTVM.
(2) Play back the 5kHz signal segment of the alignment tape (KR5-2H).
(3) Adjust the azimuth adjustment screw on the audio head for a maximum VTVM reading. (See Fig. 4-25).

**Note:** Loosen azimuth adjustment screw before the adjustment and tighten it after the completion.

#### 2) CTL Position Adjustment

Adjust ACE head position so that the RF output waveform is maximum when the tracking control knob is at center click.
Refer to the section on "ACE Assembly Position Adjustment" in the Service Manaul.

**Note:** Be sure to perform with tracking control knob at center click.

**CTL Head (ACE Assembly) Position Adjustment**

This adjustment is both mechanical and electric: mechanically, it is the adjustment of the CTL head position, and electrically, it is the tracking control center adjustment. The procedure involves performing the electrical adjustment first, then the head position adjustment.

(1) Connect the oscilloscope as follows:
1ch. . . . . .RF out
2ch. . . . . .AUDIO out
external trigger . . . . . SWITCHING PULSE out

(2) Replay the tracking portion of the alignment tape (KR5-2H).

(3) Turn the tracking control knob back and forth, and confirm that the output waveform level is maximum at the center click position, and that the 0 level of the audio signal is at the point where the RF output waveform Bch waveform appears, as shown in Fig. 4-26. If adjustment is necessary, proceed as follows.

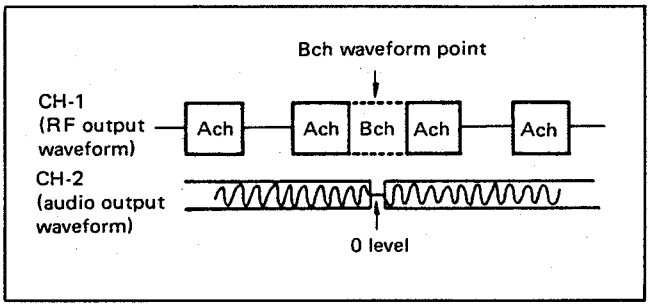



*Fig. 4-26*

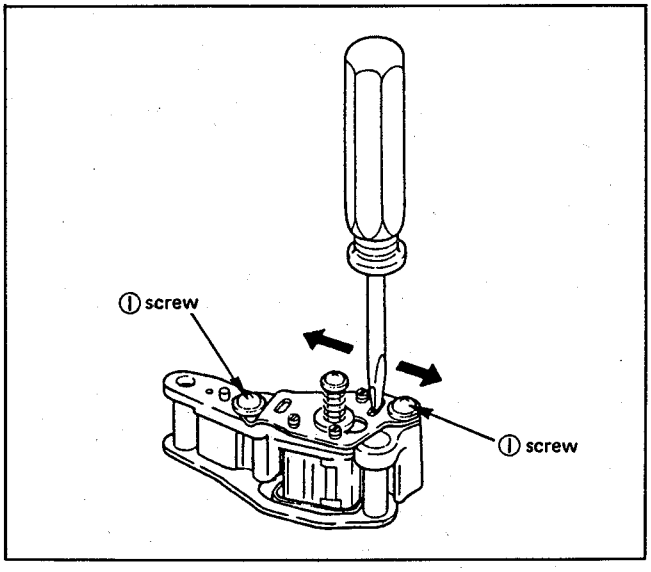



*Fig. 4-27*

(4) Tracking Control Center Adjustment.

(5) CTL Head Position Adjustment
Set the tracking control knob at the center click position and loosen the two ACE assembly position adjustment screws ① .
As shown in Fig. 4-27, slide the ACE assembly with a screwdriver until it is in the position shown in Fig. 4-26 and the RF output waveform is maximum. Tighten the screws when this position is obtained.

(6) Replay the color bars of the alignment tape and check the picture quality.

## 4-7. Aduio Height Adjustment

This adjustment is basically unnecessary, as it is pre-adjusted at the factory. The same applies to the repair ACE assembly. However, if the adjustment screw has been touched and it is absolutely necessary to adjust, perform the following procedure.

**Parallel Adjustment Relative to ACE Head Guide**

1) Place the parallel plate SL-0657 on No. 5 guide and audio/CTL head. (Fig. 4-28)

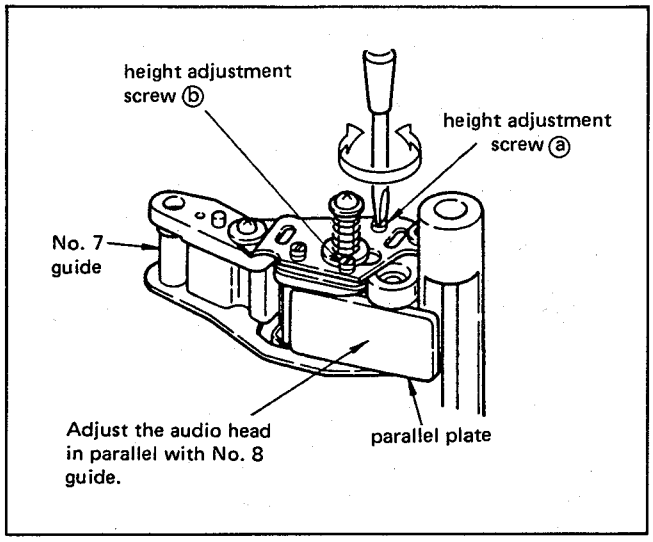

height adjustment screw ⓑ
height adjustment screw ⓐ
No. 7 guide
Adjust the audio head in parallel with No. 8 guide.
parallel plate

*Fig. 4-28*

2) With No. 5 guide as reference, confirm that there is no space between the audio/CTL head and the parallel plate.
If there is space at the top (Fig. 4-29 ① ), adjust by turning the height adjustment screw ⓐ counterclockwise. (Fig. 4-28)
If there is space at the bottom (Fig. 4-29 ② ), adjust by turning the height adjustment screw ⓐ clockwise.
(Jedge if there is space by pressing the parallel plate with a finger to see if there is play.)

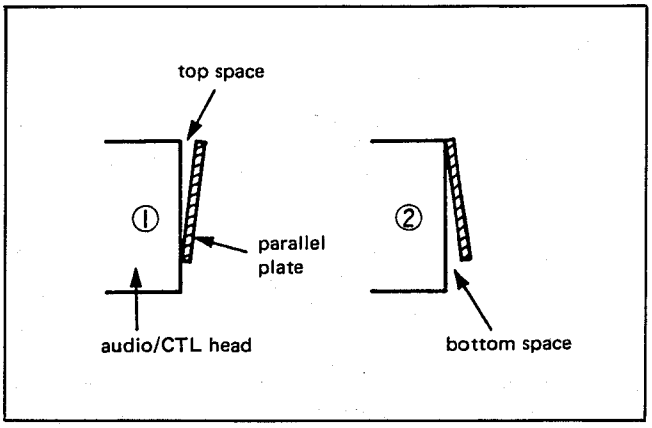



*Fig. 4-29*

3) Put KR5-2H into FWD.
4) Perform azimuth adjustment according to the Service Manual.
5) While observing the audio head (Fig. 4-30) with a dental mirror, match up the core upper edge and tape upper edge as in Fig. 4-31, with the two height adjustment screws and the azimuth adjustment screw.
Turn the two height adjustment screws in the same direction at the same angle, and the azimuth adjustment screw in the opposite direction at the same angle. Be sure to turn all three screws.

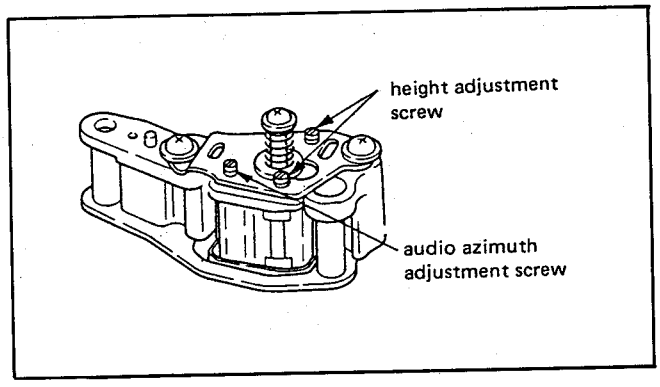



*Fig. 4-30*

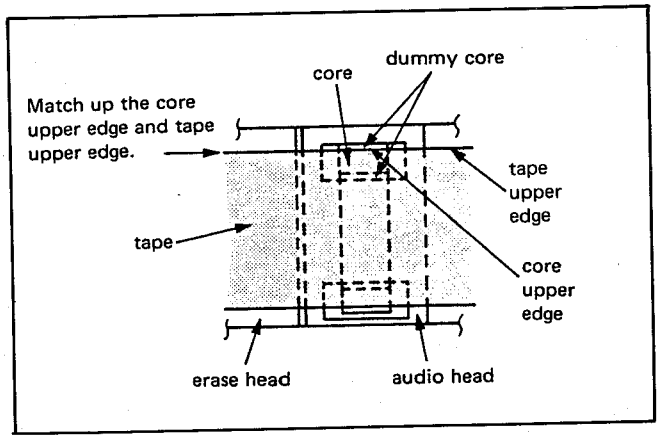



*Fig. 4-31*

6) From the position in 5), turn the two height adjustment screws clockwise 70° and turn the azimuth adjustment screw counterclockwise 70°. (This adjustment makes the tape upper edge 0.1mm above the core upper edge.)
The ACE head adjustment affects tape path, so it is necessary to perform exit side tape path adjustment and CTL position and azimuth check and adjustment.
Perform the exit side adjustment and audio/CTL position adjustment in the previous sections.

## 4-8. Self-Recorded RF Output Waveform Check

1) Set the tracking control knob to center click.
2) Record an on-the-air signal on an L-500 tape, rewind and play back.
3) Confirm that the RF output waveform satisfies the conditions in Fig. 4-32. If not, readjust tape path.

① $\frac{E\ min}{E\ max} \geqq 65\%$

② at 80% interval, $\frac{E}{E\ max} \geqq 80\%$

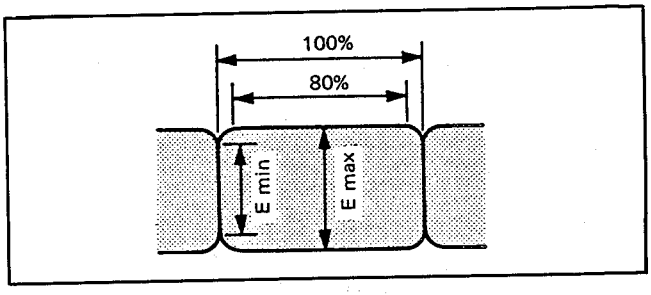



*Fig. 4-32*

## 4-9. Pairing Check

1) Set the tracking control knob to center click.
2) Record an on-the-air signal on an L-500 tape, rewind and play back.
3) Check CH-A, CH-B RF output levels.
4) Match up CH-A and CH-B RF output levels with RP board CH balance. (Fig. 4-33)

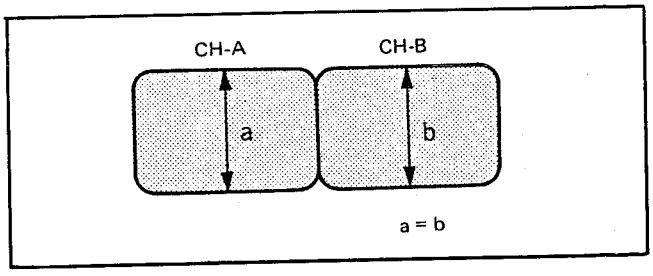



*Fig. 4-33*

5) Adjust oscilloscope V GAIN so that the RF output waveform on the oscilloscope is 5cm.
6) Turn the tracking control knob to the right, as seen from the front, and make the large output waveform 2cm. (Fig. 4-34)

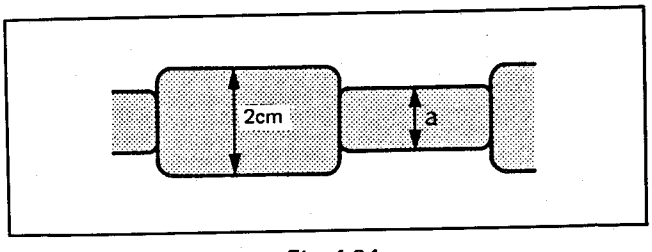
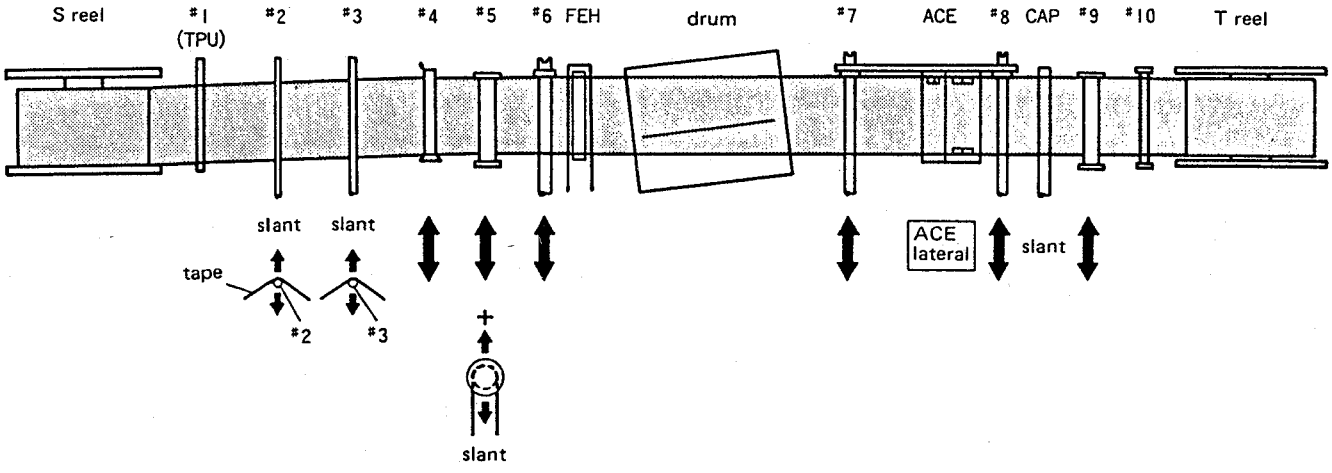



*Fig. 4-34*

7) At this time, check that the small output channel's output satisfies the specification. Specification: Small output CH 1.0 – 2.0cm (Fig. 4-34 ⓐ )
8) Return oscilloscope V GAIN to its original state, and return RF output level to the state in 3) with CH balance.

### 4-10. Tape Running Development Chart




The arrows show the directions of the movement.

*Fig. 4-35*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# D-50MkII/D-7S

# SERVICE MANUAL

## CORRECTION

File this correction with the Service Manual.

: corrected portion

D-7S:
*US Model*
*Canadian Model*

D-50MkII
*AEP Model*
*UK Model*
*E Model*
*AUS Model*

No. 1
March, 1986

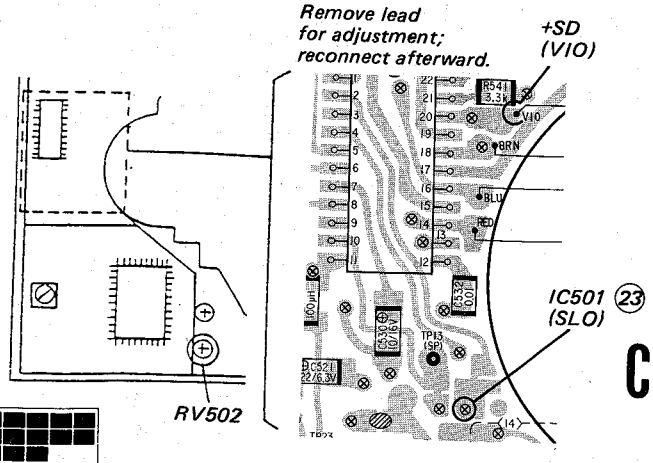
**Page 9**

### SLED MOTOR OFFSET CHECK AND ADJUSTMENT

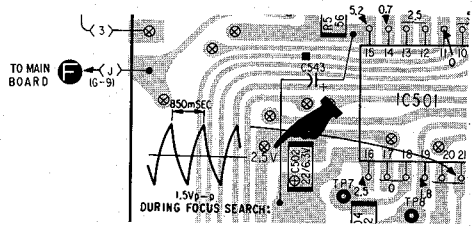
**Adjustment Procedure:**

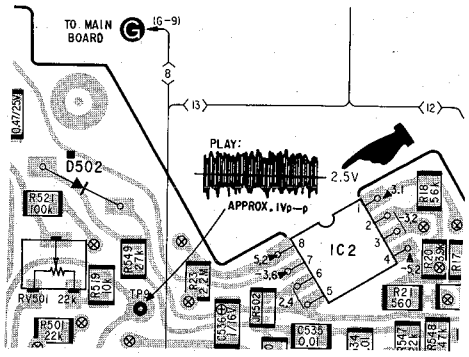
1. Remove the sled motor +SD lead. (In this adjustment, DC voltage is applied to the tracking amp inside IC501, so this prevents the sled motor from running at abnormal-high speed if RV502 is adjusted too far to the + or – side.)
2. Connect the oscilloscope to main board IC501 pin (23) (SLO).
3. Put the set into service mode (see page 7 – 9).
4. Press the KEY-MODE button (Tracking and sled go ON.)
5. Adjust RV504 so that the oscilloscope reading is $50\ ^{+50}_{-0}$ mV.
6. Press the ■ key.
7. After adjustment, release service mode (see page 7 – 9).
8. Reconnect the sled motor lead removed in step 1.

**Adjustment Location:** servo board

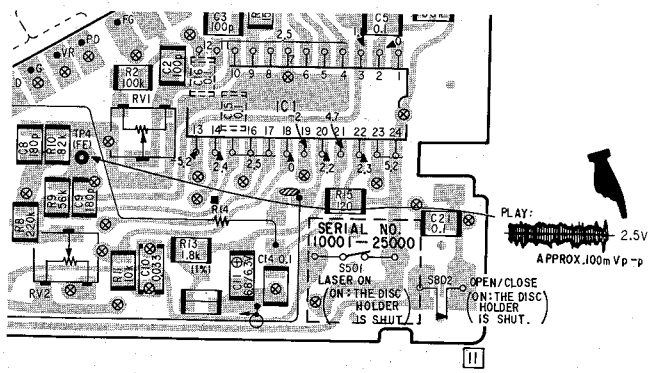



**Page 37** MOUNTING DIAGRAM




**Page 38** MOUNTING DIAGRAM




# COMPACT DISC COMPACT PLAYER

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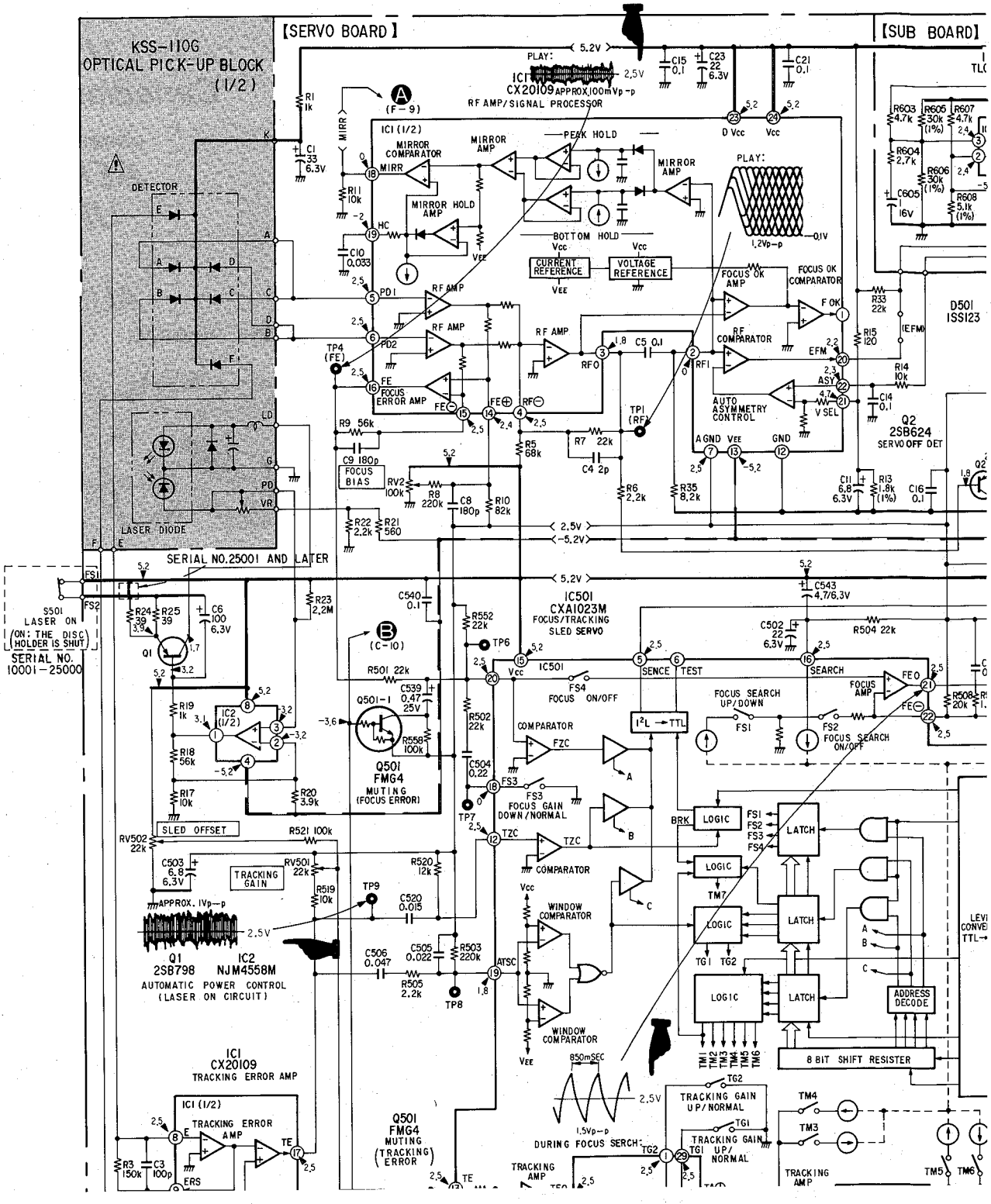
MICROFILM

AUD

Page 39 **SCHEMATIC DIAGRAM**

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**Sony Corporation**

# D-50MkII/D-7S

# SERVICE MANUAL

D-7S:
*US Model*
*Canadian Model*

D-50MkII:
*AEP Model*
*UK Model*
*E Model*
*AUS Model*

## SUPPLEMENT

File this supplement with the Service Manual.

**Subject: CHARGE CIRCUIT CHECK**

No. 1
February, 1986

- Charge circuit check procedure is not described in the D-50MkII/D-7S Service Manual previously issued.
  See this supplement for charge circuit check procedure and file with the D-50MkII/D-7S Service Manual.

### Charge Circuit Check

1. Connect a 10 kΩ resistor as shown in Fig. A. (Between pin ① and pin ③ of battery terminal CNJ401.)
2. Supply 9 V dc through external power jack.
3. If the voltage of pin ② of CNJ401 is 7.3 V, charge circuit is normal.

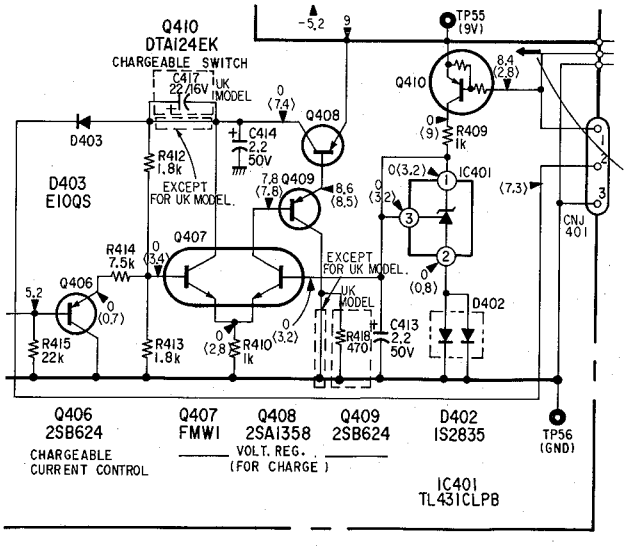


*Fig. B Voltages of Each Part*

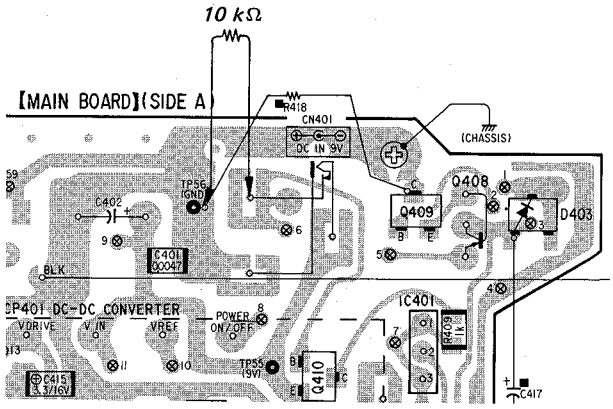


*Fig. A Connection*

- Power voltage is 9 V and fed with regulated dc power supply from DC IN 9V (external power) jack.
  Readings are taken under so-signal conditions with a VOM (50 kΩ/V).
  no mark: stop condition in service mode.
  < >: stop condition on normal operation when POWER SW is ON by connecting a 10 kΩ resistor between pin ① and pin ③ of CNJ401.
  Voltage variations may be noted due to normal production tolerances.

## COMPACT DISC COMPACT PLAYER

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